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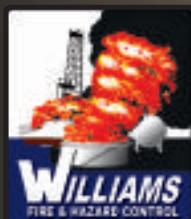
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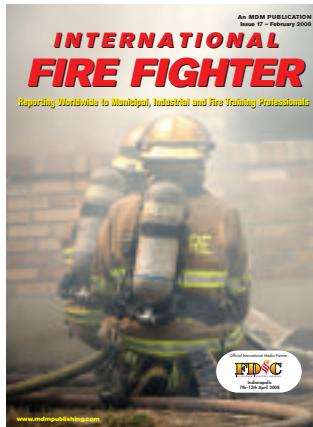
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## February 2008 Issue 17



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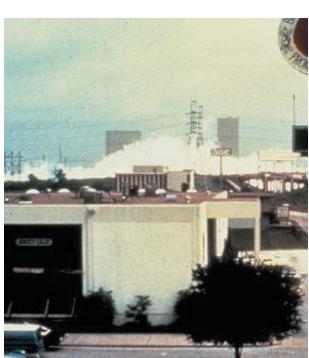
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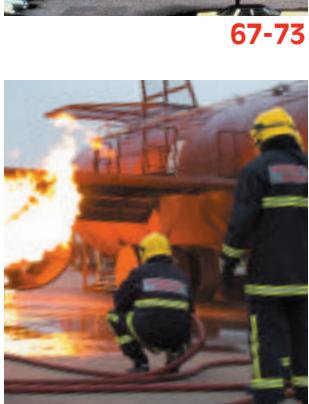
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# Bronto Skylift 42m unit delivered to Greenland

The first fire fighting aerial ladder platform in the history of Greenland was delivered in October 2007. The unit handed over in the city of Nuuk (Nuummi Qatserisartut) is a 42m truck mounted platform manufactured and sold by BRONTO SKYLIFT.

Greenland, the world's largest island, is a place of extreme Arctic conditions: an ice cap covers approximately 95% of the island. It was originally home to prehistorical Paleo-Eskimos and was discovered by the Vikings on the 10th century, but the direct ancestors of today's Greenlanders, Inuits, did not arrive until the 13th century from the northwest. Today Greenland is an autonomous province of Denmark with a population of approximately 57000. Nuuk is the oldest city in Greenland, founded by a Danish missionary on the southwest coast of Greenland in 1728. Being the capital of Greenland the city is also the largest in the island with approximately 15,000 inhabitants. The human activities – creating and including the need for fire fighting – are restricted to the coast around Nuuk. There is only 100 km (approximately 62 miles) of road in Greenland, and the longest street is the one from Nuuk centre to the airport.

The main business sector of Greenland has always been fishery, but the industrial development (exploring oil & minerals) as well as social progress and especially increased tourism have multiplied the requirements for the rescue and fire fighting. Today Nuuk Fire Service is staffed by 35 employees and including the smaller



villages in the Nuuk region approximately 20 more. The incidents attended by Nuuk Fire brigade are predominately domestic fires, but occasionally also container and vehicle fires. The fire brigade has 175-200 alarms per year. Before the delivery of Bronto Skylift aerial ladder platform the fire brigade had a 30m ladder vehicle, three big fire trucks, a water tanker with a capacity of 7m<sup>3</sup>, several rescue boats and snow scooters etc.

The brand new Bronto Skylift aerial ladder platform with the max. rescue height of 42m makes it possible to perform firefighting even at the highest

building of 36m in Nuuk. The platform's maximum horizontal outreach is approximately 22m and the reach below ground level 5m. The unit has a spacious rescue cage with max safe cage load of 400kg. The Bronto aerial appliance is mounted onto Scania P340/6x2 chassis.

**For further information please contact:**  
**Bronto Skylift Oy Ab**  
**Teerivuorenkatu 28**  
**FL-33300 Tampere Finland**  
**Tel: +358 20 7927 111**  
**Fax: +358 20 7927 300**



## Orion Safety Industries Pty Limited

ORION SAFETY, the foremost foam fire protection product manufacturer and supplier in Asia and Australia, has announced the opening of their new office in Singapore to service the growing Asian market for foam fire protection equipment.

The rapidly expanding oil and gas market in the Asian region has created the need for a regional office in which to meet the demands of the increasing Orion customer base. The new office, known as ORION FIRE PTE LTD, will focus on customers throughout the Asian region. Orion Fire will offer the current range of Orion products and will work with local manufacturers to provide a lower cost base in a market where material, transport

and labour costs are under enormous pressure to increase.

Orion Fire will focus to maintain the quality of the fire protection products and services on which Orion has built its reputation, as well as working with customers whose highly demanding risks require special design solutions. The partnering of the many years of experience offered by Orion in Australia with the local market knowledge of the personnel in the Singapore office is designed to improve support for current and future customers.

**For more information visit our website at**  
**[www.orionsafety.com.au](http://www.orionsafety.com.au)**  
**Email: [sales@orionsafety.com.au](mailto:sales@orionsafety.com.au)**

# Transitional Fire

Compartment Fire Behaviour Training is now recognised as one of the 'must have' risk critical core skills. Competence in appreciating fire behaviour allows fire fighters to pre-empt the situation inside a building and is a key factor in carrying out a dynamic risk assessment and allows those tasked with attacking the fire to make educated decisions on their surrounding environment.

TRANSITIONAL FIRE's director, Graham Leney, started off by working with the Devon and Somerset Fire & Rescue Service in developing their Compartment Fire Behaviour Training Facility . D&SFRS are seen as one of the leading training providers in CFBT in the U.K. The original container systems were based on the traditional Swedish design.

By working hand in hand with experienced end users and through continuous development, Transitional Fire, are now producing more advanced products and designs to provide Fire Services with the tools to train Fire Fighters with the most realistic Fire Behaviour Systems available.

Transitional Fire had the pleasure is sponsoring the South East CFBT working group in September. They also attended the National CFBT working group recently held in Jersey. Graham Leney said, 'above all the one thing that stood out was the commitment and expertise in the services providing CFBT'. Compartment Fire Behaviour Training saves lives, we are proud to be able to assist in this vital training. Our aim is to deliver and design products to a set standard to ensure CFBT is carried out and delivered in the safest environment available.



Our Multi Trainer's are proving a huge success. To train Crew, Watch and Station Managers in dealing with multi pump incidents they are proving invaluable. To enhance the Multi Trainer we have now teamed up with PSB who are a specialised company dealing with air extraction. We can now provide smoke extract systems to



our whole range of products. With PSB we are now developing a long awaited smoke filtration system, this is an alternative to the highly expensive LPG fuelled smoke scrubbers. The smoke filtration system should be available early in 08.

One of the design aspects of the Multi Trainer was to allow crews to train at in all levels of Tactical Ventilation. Because of this we now offer the full range of Tempest PPV products.



Transitional Fire provide everything from ground work's, maintenance, design , porta cabins and repairs to existing structures. A range of classroom aids are available and they are now working at providing a new range of temperature monitoring equipment along with instructor/student welfare aids.

Advice has been given to a number of overseas Fire Services from Western Australia to Bolivia on how to deliver CFBT to their services. By request they can provide model lesson plans , model risk assessments and maintenance advice to customers.

Recent UK projects have included



## Clifford Jones comments on BLEVE behaviour

To the article on pp. 67-68 of the November 2007 issue of IFF entitled 'You better BLEVE it' might be added the following points of interest.

A BLEVE is a physical not a chemical phenomenon. When a pressure cooker blows up that is a BLEVE. If it happens that the vapour having leaked is flammable and there is ignition the combined course of events is called a BLEVE-fireball. BLEVE behaviour only occurs where a liquid is contained in equilibrium with its own highly super-atmospheric vapour pressure. In the storage of hydrocarbons and derivatives thereof the most important such substances are LPG and vinyl chloride monomer (VCM). The statement in the article under discussion that '...vapour is generated inside causing the internal pressure to rise rapidly' is not a helpful way of describing a BLEVE as with LPG and VCM the internal pressure is high before accidental heating ever began.

An interesting though certainly tragic anecdote will conclude this letter. Some years ago in the US someone threw a half-empty bottle of beer on to a bonfire having replaced the screw cap. The resulting BLEVE killed one of the other persons attending at the bonfire. Throughout the heating of the contents of the bottle prior to explosion there would have been phase equilibrium hence the points made in the previous paragraph about BLEVE behaviour are fulfilled. So in this fatal incident there was a BLEVE but not a BLEVE-fireball and the distinction is fundamental.

**Clifford Jones**  
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University of Aberdeen  
[j.c.jones@eng.abdn.ac.uk](mailto:j.c.jones@eng.abdn.ac.uk)

Cornwall Fire & Rescue Service and Devon & Somerset Fire & Rescue Service.

Apart from CFBT the simulators are an ideal test bed to trial new equipment, PPE and more recently compressed air foam systems.

All Transition Fire's products can be leased or rented at extremely favourable rates.

For more information please visit their website [www.transitionalfire.com](http://www.transitionalfire.com) or ring 01404 811799.

# Waterous Eclipse Series CAFS

## New Apparatus Equipped With Waterous Eclipse Series CAFS Helps Protect The JANAf International Oil Transport System

Famous for its wooded mountains, vast national parks and a coastline that overlooks the Adriatic Sea, the small country of Croatia is home to Central and Eastern Europe's most vital conduit of crude oil – the Jadranski naftovod (JANAf) Oil Transportation System. Designed to carry up to 34 million tons of oil annually (MTA) from the port and terminal of Omisalj, to local and foreign refineries throughout Europe, the pipeline currently runs at roughly 20 million MTA.

In transporting such a large amount of crude oil, keeping the 759km pipeline running safely is critical to meeting the demands for the resources. So in January of last year, JANAf approached one of Croatia's leading fire truck manufacturers, MG-Rijeka, to design and build an advanced firefighting apparatus. The new apparatus would be used to provide emergency fire suppression services for one of the company's main storage facilities at Omisalj terminal.

Located on the northern part of the Island of Krk, Omisalj Bay, is where the crude oil supply comes in and is shipped out. Its strategic location protects the facility from the elements of the wind and water, which makes the loading and unloading operations run efficiently. Omisalj also houses a storage tank farm with a maximum capacity of 760,000m<sup>3</sup> as well as a pumping and metering station located near the port.

To protect this facility, JANAf decided that a highly advanced fire suppression program and apparatus needed to be in place. The apparatus that MG-Rijeka proposed would be the first of its kind in Central and Eastern Europe. Made on a MAN TGA 33.480 6x6 BB chassis, the vehicle featured the first ever Eclipse™ series CAFSystem™ from Waterous that had a bronze-made 2000 GPM CMU Pump and C10C transmission on it. The pump, which also featured a 1000 GPM Foam Manifold, used a FoamPro foam proportioner and VPO Iron Priming Pump to deliver the Class B foam.

In addition to the Eclipse pump, the new truck is loaded with advanced technology. With touch-screen controls, controlling the water and foam monitors on the vehicle, controlling the pressure and capacity, alarms, turning on and off the pump, controlling all functions of the foam proportioners, turning on the vehicle's self-protection system, are all simplified for the operator.

Passing all of the customer's performance requirements along with the required Croatian firefighting attestation certifications, the new apparatus was a success. Korina Baresic, general manager for MG-Rijeka was pleased with the apparatus, "The main treasure of MG-Rijeka is our team of engineers,



technicians and designers who made this truck a success for our customer. I call them the 'Dream Team'."

Upon delivery of the truck, the MG-Rijeka 'Dream Team' trained the JANAf staff for four days, showing them how to operate it properly. "Training is important to the effectiveness of the vehicle," stated Baresic. "We want our customers to get the best performance possible, especially when the situation calls for it."

The event, which drew some of the country's most notable firefighting and oil industry leaders including the Deputy Minister of Interior from the Ministry of Interior of Croatia and the President of the Croatian Chamber of Commerce, was a monumental occasion for both MG-Rijeka and Waterous. "We were given an excellent opportunity by MG-Rijeka to be a part of this project and it was an honor to work with them," stated Dejan Marinkovic, Waterous Sales Manager for Central and Eastern Europe. "Since the delivery of the first truck, JANAf has bought another with our bronze Eclipse on it and they are already looking to buy a third. We even had their safety manager, Mladen Padesic and his deputy Vlado Zoric recently visit our factory along with MG-Rijeka's owners."

Baresic was excited about the collaboration with Waterous. "Thanks to their understanding and patience, the quality of the products and the efforts of their staff, our customer has been reaching excellent results."

For further information visit  
our website:  
[www.waterousco.com](http://www.waterousco.com)

# Speedings Ltd of Sunderland

Speedings Ltd of Sunderland, England are pleased to announce that they have been appointed as the sole UK Fire and Rescue Service distributors for Marlow Ropes, Conversor Limited and Illumiglow Safety. The addition of high quality products from these UK companies to Speedings already extensive product range will ensure that the customer receives the best products at the best price.

**C**ommenting on the new arrangements, Richard Edge, Sales Manager for Marlow said, "It is with great pleasure that we are able to announce that from January 1st 2008, Speedings Ltd will become sole distributors, to UK Fire & Rescue Services, of all Marlow Ropes products.

Sunderland based Speedings Ltd have been a long standing and loyal customer of Marlow and with their knowledge and extensive range of fire and rescue products, they are the natural choice for this role. Speedings are dealing with Fire & Rescue Services on a daily basis and are ideally placed to give the attention required in promoting Marlow Ropes within this rapidly expanding industry sector.

Established in 1827, Speedings Ltd is a family owned and run manufacturing business producing everything from their factory in the North East of England. This year, Marlow Ropes has been celebrating 200 years of rope manufacturing in Hailsham; East-Sussex and the partnership between two well respected British manufacturing businesses will build on the successes already achieved by both.

The relationship between Speedings and Marlow has been specifically designed to improve customer service by offering you the opportunity to source your ropes and bags from one supplier. We have also worked together to offer you very competitive pricing and in this age of 'Best Value' this will certainly be seen as a positive step.

We are also currently working on a number of revolutionary new products designed specifically for the fire and rescue market and Speedings will contact you soon to discuss these items. We are very excited about the future partnership with Speedings.

Since December 2006, there has been a legal duty on all public sector organisations to promote equality of opportunity for disabled people. Forty-five thousand public bodies across Great Britain are covered by the Disability Equality Duty (DED). The DED is meant to ensure that all public bodies – such as central or local government, schools, health trusts and Emergency Services – pay 'due regard' to the promotion of equality for disabled people in every area of their work.



**Conversor Limited** ([www.conversorproducts.com](http://www.conversorproducts.com)) is a UK-based hearing solutions company, which provides innovative and affordable products aimed at helping people of all ages who experience hearing difficulty. They offer a complete line of ALDs (Assistive Listening Devices) designed for easy use with telecoil-equipped hearing aids, cochlear implants, or binaural headphones. Our products effectively reduce unwanted background noise, and greatly enhance sound level and clarity for better hearing and relaxed conversation in a variety of everyday situations.

The provision of 'hearing loops' into fire stations and fire service premises is a very expensive and time consuming task. The Conversor range of products means that every room within the organisation becomes accessible to people with hearing impairments – you just move the hand held system to whichever room you need to use – be it an office for an interview or a lecture theatre for a seminar.

Conversor products are in use at the Fire Service College, Moreton-in-Marsh and have been endorsed by the National Disabled Fire Association.

**Illumiglow** ([www.illumiglow.com](http://www.illumiglow.com)) are based in Poole, Dorset and supply Illumiglow Safety Sticks to the emergency services and industry. The safety sticks have a huge number of uses within



the Fire and Rescue Service including Water Rescue, USAR, Confined Space Operations, Road Traffic Collisions, BA Search and Rescue etc. Advantages of the Safety sticks over other similar products include:

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**Marlow**

## NEWS

### **Entente Cordiale Behind New Bristol PPE Contract For Paris**

BRISTOL UNIFORMS has built on its growing success in France with the announcement that the municipal fire and rescue services in one of the largest areas of Paris, Versailles, has concluded a new supply contract for its fire department, SDIS Yvelines.

A long established customer of Bristol Uniforms, Yvelines, with around 3000 firefighters, has reaffirmed its confidence in Bristol as a supplier of world class firefighter clothing with a 4 year contract for structural firefighting



garments using a Nomex® outer shell with Ti-Technology from DuPont and a Goretex Airlock® moisture barrier. Yvelines has also opted for Bristol's garment repair service which forms part of the integrated managed care service from Bristol Care™ and is included in the long term contract now in place between Bristol Uniforms and the Versailles municipal fire department.

Roger Startin, Bristol's joint MD, commented on the successful conclusion to this new contract adding, "Although Bristol Care™ has been widely adopted by the UK's fire and rescue services, including a number of airports and industrial fire teams, it is only recently that we have seen the adoption of managed care services by fire and rescue services in the rest of the European Union. By further developing our logistics infrastructure we are now able to provide a collect and return service to parts of continental Europe making it feasible for a number of our major customers there to take advantage of some, or all, of the features of Bristol Care™. This reflects a growing recognition of the health and safety aspects of PPE for the wearer, and obligations of the employer, as well as an acceptance of the need for the lifetime integrity of the fire kit to be managed professionally – which often means outsourcing to manufacturers and suppliers like ourselves with the technical skills to undertake this specialised task".

For more information about Bristol Uniforms or Bristol Care™ please contact either:  
Roger Startin, Bristol Uniforms Ltd on 0117 956 3101 or email [roger.startin@bristoluniforms.com](mailto:roger.startin@bristoluniforms.com)  
or Richard Storey, RSL Associates on 01749 870652 or email [richard@rslassociates.co.uk](mailto:richard@rslassociates.co.uk)



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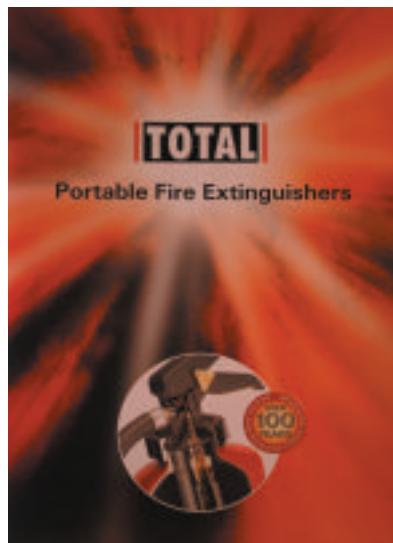


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## New Total® Portables Brochure

The TOTAL® range of premium-build portable extinguishers is described in detail in a new fully illustrated, 32-page brochure. It is available in the UK from Express Fire in Manchester and from a country-wide network of approved TOTAL supply partners that are trained to advise, install and maintain the TOTAL extinguishers in peak condition.



It details the full TOTAL offering, which includes industry-standard foam, water, CO<sub>2</sub> [Carbon Dioxide] and powder portables. These include an easy-servicing foam portable that utilises an environmentally-friendly foam cartridge, and anti-freeze protected foam and water portables. All are kite-marked approved to BS EN 3; they are also BAFE approved. Several are wheelmark certified for use in marine environments.

The brochure also describes several unique specialty portable extinguishers, each of which is designed to satisfy particular fire safety challenges or market needs. These include: powder portables for metal and coal fires; antimagnetic CO<sub>2</sub> portables for hospitals and clinics; specially-formulated water portables for sawdust fires; wet chemical portables for cooking oil and fat fires, and purpose-designed foam portables for polar liquid fires. There is also a unique "Tandem" portable/automatic extinguisher that doubles up as a fixed, automatic extinguisher for protecting unattended fire risks.

**A copy of the brochure can be obtained by telephoning Express Fire on 0161 688 5050 or Tyco Safety Products, Fire Suppression Group on 01493 417600.**

## Interfron New Product Announcement

The INTERFRON SP700 backpack power unit is the perfect solution for vehicle, train or aircraft accidents, where rapid access and prompt intervention are required. Its unique design offers operator safety and mobility, weighing only 18kg (39.6 lbs). The unit is powered by a rechargeable 12V DC battery, offering the same tool power outputs as gasoline fired systems. The SP700 may be used to power all rescue tools currently on the market (cutters, spreaders, rams, etc) working at 350, 630 and 720 bar (5100, 9200, 10500 psi). The battery has a run down time of over 30 minutes, and is easily replaced with a fresh power cell.

The SP700 is ideally suited to operation in remote areas, and for RIT, forcible entry, or anywhere combustion exhaust poses a hazard. Its quiet operation allows for a more controlled rescue scene.

The VP700 backpack power unit is identical in weight and function to the SP700. The sturdy outer case allows for operations in the most unforgiving environments, making it perfectly suited to confined space, and other high hazard areas. The straps provided are robust enough to allow the unit to be lowered by helicopter into an emergency scene.



**For more information, please contact:**  
Interfron SpA  
Tel: +39 0 185 263 636  
Website: [www.interfron-hydraulicrescue.com](http://www.interfron-hydraulicrescue.com)

# Total® portables deliver premium-brand performance

Internationally-approved and manufactured in Germany to the industry's most exacting standards, the TOTAL® range of premium-build portable extinguishers comprises a broad selection of industry-standard models. They are suitable for Class A, B, C, D and F fires using a range of foam, water, dry powder and CO<sub>2</sub> (carbon dioxide) extinguishing agents. The TOTAL offering also includes a number of unique speciality portable extinguishers, each of which is designed to satisfy specific fire safety challenges or market sector needs.

**E**ven the standard portables have set new benchmarks by incorporating such features as cartridge operation for the Eco Range model that extends the life of the foam cartridge when compared with standard pre-mix foam portables. Other class-leading developments include the addition of antifreeze protection for the water and foam portables that can withstand temperatures that plummet as low as minus 20°C, and a performance-enhancing swirl-effect, multi-spray nozzle for the foam portables.

A number of the TOTAL portables are "wheel-mark" certified to EU Marine Equipment Directive MED 96/98/EG to ensure their suitability for maritime use and compliance with the relevant international marine regulations. In all, there are currently 12 models from which to choose.

The special TOTAL portables have, understandably, created considerable interest due to their ability to provide a higher degree of protection in special risk areas. Currently, the line-up includes powder portables for metal fires that, typically, can reach temperatures in excess of 2000°C, and coal and coal dust fires where even the smallest amount of kinetic energy can result in an explosion.

Other TOTAL special portables include anti-magnetic CO<sub>2</sub> portables for hospitals and clinics, where magnetic interference could potentially damage sensitive equipment, and specially-formulated water portables for sawdust and other dust fires. Special wet chemical portables are also available for the high-risk Class F cooking oil and fat fires, as are purpose-designed foam portables for challenging polar liquid fires that use a specially-formulated foam agent developed by Tyco, and incorporate a nozzle designed to deliver the optimum foam density.

Engineers at the TOTAL dedicated portables research and manufacturing facility in Neuruppin in Germany, where the TOTAL portables are produced, have also devised a unique "Tandem" portable automatic extinguisher. These are portable extinguishers that, in addition to being operated in the usual manner, can also be used as wall-mounted automatic extinguishers that provide around-the-clock protection for special hazards. In automatic mode, the agent flow is activated by a special sprinkler sensor to provide protection for a designated area. Depending on how high the Tandem portable is positioned, this area is between four metres and six metres for the dry powder model, and four metres by four metres for the foam version.

However, what most sets TOTAL portables apart



from other extinguishers on the market is their unrivalled build quality and meticulous attention to detail. Virtually every stage of cylinder manufacture is under the direct control of TOTAL, including material selection and sourcing in Europe, the most advanced low-heat plasma welding, fabrication, assembly and high-performance powder-coating, cylinder pressure testing and agent filling. This commitment to quality is underpinned by uniquely numbering each and every TOTAL cylinder to provide a complete and reliable quality audit trail.

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TOTAL portables are guaranteed for five years, providing they are serviced from new in accordance with the appropriate regulatory standards. **IFF**

*TOTAL portables are available in the UK through Express Fire in Manchester on 0161 688 5050, or from Tyco Fire Suppression & Building Products on 01493 417600.*

# W.S. Darley celeb



Since 1908, Darley has been dedicated to serving the World's Fire and Emergency Services. Our corporate headquarters are located at 325 Spring Lake Drive in Itasca, IL 60143, and our manufacturing, engineering and research and development operations are in Chippewa Falls, Wisconsin and Toledo, Oregon.

**W**.S. Darley & Co. has purchased a new headquarters in Itasca, IL. The new facility is over 40,000 sq feet and is located about 10 minutes from their previous headquarters in Melrose Park, IL. According to company president Paul C. Darley, "We had been in our previous building for almost 50 years. Our business is growing, and this new state-of-the-art facility has almost double the amount of space that we had in our Melrose Park headquarters. This new building also better reflects our corporate image as we move into our next 100 years of business. It will allow us to continue to expand our business to better serve the needs of our growing customer base." Darley is currently making some improvements to the building and will move into the new facility in January, 2008. The new building is located at 325 Spring Lake Drive in Itasca, IL 60143. All telephone numbers will remain unchanged.

We remain a family owned and operated business committed to customer service and our employees. Company operations are overseen by the executive committee consisting of three Chief Operating Officers, Jeff, Paul and Peter Darley. The Chief Executive Officer is Bill Darley and he is certified engineer and has been with our company for over 50 years. He is one of the most respected individuals in the fire service due to his commitment and integrity. He served as President of the Fire Apparatus Manufacturers Association and currently serves on several corporate and charity boards.

Our entire company is committed to customer satisfaction. We are dedicated to excellence and offer a diverse line of quality products and services through progressive design, manufacturing and distribution.

W. S. Darley & Co.'s involvement in the Fire Industry spans over a century and three generations of Darleys. They not only have a rock solid reputation for building quality products, but also for building strong relationships with Fire Fighting Organizations around the world. Darley draws their strength from being a financially stable company with a unique industry position. Darley builds Fire Trucks, manufactures Champion Fire Pumps and sells Fire Fighting and Emergency Equipment through its international catalog. Nowhere else will you find a company as dedicated to the Fire Industry. All this experience comes from a company that cares – W. S. Darley & Co. is customer driven.

## Equipment

Darley offers thousands of products available through a variety of catalogs. The 2008 fire catalog includes over 325 new items, with even more being added to our website, [www.edarley.com](http://www.edarley.com).

Domestic preparedness has become an important focus for many of our customers. We've listened to your needs and have increased the selection of de-contamination shelters, portable showers, and protective apparel to help you deal with virtually any potential threat.

## Pumps

Whatever your fire fighting needs, Darley has the right pump to do the job. We offer portables, floating, high-lift booster, CAFS, PTO, engine driven, front mount, and midship pumps with flows from 60 to 2500 GPM and pressures to 1200 PSI. In addition, all Darley midship pumps are UL ratable and meet NFPA requirements. From the smallest skid-mount to the chassis mounted midships, every Darley pump is designed for fast, efficient and safe operation.

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## **Apparatus**

Darley & Co. offers a full range of apparatus, including mini-pumpers, tankers, commercial and custom pumpers. Darley is known for building specialized apparatus that often includes compressed air foam systems and co-polymer bodies. These features are evident in Darley's premier program series apparatus, which is called "the firetruck". You can expect an unmatched level of quality and service from Darley's entire line of vehicles.

## **Pump systems**

Darley combines its unique strength as a builder of both pumps and apparatus by offering a line of pump systems. A wide variety of pump systems are available including top and side operated, midship and PTO driven pumps. The systems often include specialized features such as "Vision Series" panels complete with "one touch controls". All of our systems are designed to be easy to operate and easy to maintain.

## **AutoCAFS**

Compressed Air Foam Systems (CAFS), provide superior firefighting capabilities offering quicker knockdown and improved personnel and structural protection. Darley's AutoCAFS compressed air foam systems are the choice of informed firefighting professionals across the country and around the world. Engineered for simplicity and performance, these systems are known for their reliability and high quality.

## **Odin Foam Division**

Odin Foam Division is the world's leader in Compressed Air Foam Systems (CAFS) research and development. At Odin, we produce the safest and most reliable CAFS of any manufacturer today. Odin is based in Toledo, Oregon and is now a division of Darley Company. Odin is one of the oldest and most experienced manufacturers of Compressed Air Foam Systems. Odin Company has fought fires under contract with various organizations. Having first hand experience in firefighting gives Odin and Darley the knowledge of what works best when it comes to engine driven Compressed Air Foam Systems.

## **Ohler Pumps**

W.S. Darley & Co. is proud to announce the asset purchase of Ohler Machinery Company. Ohler is located in Janesville, Iowa and was established in 1947 by Ralph G. Ohler.

Marketed under the brand Ohler Pumps, this innovative company has produced thousands of pumps for the US Military, US Coast Guard as well as pumps and related equipment for the agricultural, industrial, mining and marine industries.

Ohler Machinery is the maker of dependable, rugged and powerful centrifugal pumps, ranging from 1" to 6". We supply the agricultural, mining, and construction industries with a wide variety of pumps for many different applications. Ohler Machinery also does metal fabrication for numerous customers as well as the government. Ohler is manufacturing 2,300 refueling and potable water transfer pumps for the US Marine Corps.

## **Polybilt**

In 2001, Darley partnered with ProPoly Inc. to start a new Company, Polybilt LLC. PolyBilt has been

manufacturing the latest state-of-the art truck products and bodies for the fire truck market and is positioned to provide a variety products for the commercial truck market as well. We took the same science of the Poly Water Tank, including patented Bent Edge™ features which revolutionized the fire industry with maintenance-free water and foam tanks, and designed the ultimate in fire truck body design. Polyprene™ provides for years of trouble-free service life and will not rust or corrode. Also, unlike other materials such as aluminum and steel, our material will not ding, dent or crack.

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Darley has the plants, engineering and machinery to design, manufacturer and assemble a wide variety of fire and emergency products. Our engineering staff includes certified and professional engineers. Our company utilizes the latest in Computer Aided Design (CAD), and Computer Aided Manufacturing (CAM) to ensure that all manufacturing designs are completely incorporated within the manufacturing process.

Our dealer and service network consists of over 200 US distributors in all 50 states. We have more than 50 International dealers located in over 40 countries. Our products are found in more than 70 countries around the world. Parts and service are also directly available from our plants with the convenience of toll-free numbers, fax and telex. Our goal is to ship replacement parts within 24 hours after receipt of order.

## **Extensive experience**

W. S. Darley & Co. has been supplying apparatus, pumps and firefighting equipment to the United States Federal Government as well as other governments and agencies around the world for over 60 years. During World War II, we received the Army/Navy E Award for excellence three times, producing thousands of centrifugal fire pumps for military bases around the world. Many of these pumps are still in service today. Each year we are awarded hundreds of federal government contracts primarily for supplies from our fire fighting, law enforcement and municipal supplies catalogs. Following are some major orders received in recent years:

- 500 HM pumps for Saudi Arabia Civil Defense
- 43 PSR 1000 Ghana National Fire Service
- 60 Floating Dolphin Pumps for Indonesia 2002
- 112 PSM for Saudi Arabia 2002
- 2100 P-100 pumps for US Navy 1196-2002
- 30 HE500 for CFS Australia 2001
- 35 P-100 pumps for Brazilian Navy 2001
- 40 P-100 pumps for Spanish Navy 2001
- 150 Floating Dolphin Pumps for Malaysia 1999
- 650 2BE for Manila Philippines 95-96
- 50 HH for U.S. Navy
- 141 SP/SPR/2BE for Taiwan 91-92
- 122 HE/KSP 1-1/2 for Australia 93-95
- 405 HM & KSM for USAF Tankers 86-87
- 80 HM for New Zealand 91
- 229 LDM for USAF Structural Trucks 91-97
- 1350 2BE for U.S. Navy 95-97
- 120 JMP for California Forestry 91-97
- 175 2BE 6.5 H U.S. Coast Guard 98- 0

IFF

# Kermel: Innovation and Design provides Ultimate Firefighter Protection

KERMEL is at the forefront of firefighter protection around the globe. The company's unique fabrics protect firefighters from head to toe against heat and flame, delivering impressive standards of performance and stability.



Innovation is key to the company's success in developing a wide range of textile solutions that protect within every layer of clothing, whether in the outer shell of structural ensembles, or in underwear and even wildland garments.

The secret of the KERMEL's success lies in its unique polyamide-imide meta aramid fibre that is inherently non-flammable. Across all of its wide range of applications there are four core properties that make Kermel® fabrics unique:

#### ***Thermostability***

Kermel® fabrics are highly stable when exposed to flames and do not melt or burn when exposed to high temperatures.

#### ***Non-Flammable***

Kermel® fabrics are inherently and permanently non-flammable. The only type of fabrics that deliver permanent flame resistance to the wearer for the lifetime of the garment are those that are inherently flame resistant, as opposed to those that are a blend of treated fibre.

#### ***Chemical Resistance***

Kermel® fabrics offer protection against most chemical agents including, cold acids and dilute alkalies and most organic solvents, chlorine bleach and detergents.

#### ***Thermal insulation***

Kermel® fabric is a highly efficient thermal insulator, providing essential protection from heat, even with lightweight fabrics.

#### ***Underwear***

KERMEL has developed a wide range of non-flammable underwear that significantly improves air permeability and moisture management for the wearer. Because Kermel® fibre is intrinsically soft to the touch, it delivers high levels of comfort for the wearer, especially in knitwear that is worn next to skin, such as balaclavas, tee shirts, sweatshirts and polo shirts.

#### ***Fire suits***

Kermel® fabric can be used in all the different layers of a structural firefighting garment including the outer fabric, membrane support, thermal barrier and lining. It meets the EN 469 standard and delivers outstanding levels of performance and comfort for the wearer.

When used in structural fire suits Kermel® fabric helps to keep the body temperature at optimum level for the wearer. The body is most efficient when operating at 37°C. Any higher than this and heat stress can occur, resulting in loss of consciousness

and even cardiac arrest. Kermel® fabric combines strength and performance with comfort and very light weight, ensuring that the risks of heat stress are significantly reduced for the wearer.

That inherent strength is essential in protecting firefighters from the challenges that they face on a regular basis. That's why all Kermel® fabric has exceptional tear strength combined with a high resistance to chemicals.

KERMEL's V50 and V70 fabrics meet EN 531 and ISO 15384 standards and have been incorporated into firefighter protection around the world and are complemented by the company's most recent development – H66 fabric. The H66 fabric has been specifically designed to deliver higher levels of performance than standard fabrics and is based on a double facing weave technology commonly used by KERMEL.

Reinforced by a special filament yarn, Kermel H66 fabric is extremely tough, with outstanding mechanical properties and a very high resistance to degradation from UV light. Extended testing on H66 fabric resulted in only 15% loss in tensile strength after 100 hours exposure to Xenon light. In the same test, other para-aramid fabrics lost at least 50% of their tenacity. Test results are much higher than the standards defined by EN469.

#### ***Wildland garments***

KERMEL has developed a unique new garment and backpack solution for fighting wildland and forest fires.

The specially designed suit is made from a single layer antistatic Kermel® fabric and meets ISO 15384 when worn on its own and ISO/CD 16073.2 when worn over station wear. Available in orange yellow or red, the garment is considerably lighter than structural kit and incorporates an adjustable cord to prevent 'chimney effect' and a thumb hole in the cuffs to ensure that sleeves stay down, reducing the risk of burns to the wrist and arms.

The solution also incorporates an integrated hood that fits easily over a helmet and provides increased facial protection.

The company has also developed a modular fire resistant backpack for wildland firefighters that allows them to carry essential equipment when in action. The backpack incorporates a water reserve for that allows the firefighter to take on fluids while working. The top of the pack holds an emergency respirator with quick release system. Further pouches contain additional protective clothing such as jacket and trousers and an aluminised poncho. **IFF**

#### **For more information**

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# Fire Fighting Helmet Standards are a-changing:

## But are they changing fast enough?

**By Keith Ward**

Pacific Helmets  
(Australia) Pty Ltd.

2007 has seen significant changes to the various international Standards for structural fire helmets, and more are underway.

The latest 5-year update to NFPA 1971 was released earlier this year, and the result of the vote on the final revision of EN 443 is due before year-end. While the extent of changes to the NFPA Standard (as far as helmets is concerned) were minimal, the update to EN 443 is very significant and is complicated by virtue of the serious mismatch of EN 14458:2004 with the EN443 document.

The update of the Asian-Pacific region Standard AS/NZS4067 (Structural helmets only) is progressing thanks to the work of the SF49 committee. While it is early days, the committee is clearly aware of the changes to other international Standards and will be looking to incorporate those that are appropriate for fire fighters in the region.

Despite this progress to update to the various Standards, some helmet manufacturers are already offering new designs that stretch the basic

concepts of new Standards. These commercial realities are likely to continue. Innovative manufacturers are well aware that for almost 90% of the time a helmet is worn, many front-line fire crews are wearing products that are too heavy, perhaps over-protective, impractical or inappropriate to the job at hand.

By far the majority of tasks facing structural fire fighters have little to do with structural building fires, yet the helmet they wear is designed assuming maximum risk and therefore has maximum weight and size. In the past this over-protection has been necessary because Fire Brigades have had to protect their crews and it has not been possible to separate various risk factors and wear helmets appropriate to the task.

This may be fine in the US market where bigger and heavier always seems to be better, but over weight and excessive size is an issue for Asia-Pacific



area fire fighters just as it is in Europe.

In trying to overcome the excesses of past helmet designs, one real challenge for helmet manufacturers is the fact that design restrictions written into helmet Standards can prevent radical new concepts reaching the heads of fire fighters. For instance, the NFPA 1971 document writers appear to get themselves in a knot about the 'jet-style' helmet shapes appearing in their market. Currently (though some manufacturers have tried), almost no jet-style structural helmets can be fully certified to this standard.

Similar problems affect helmet manufacturers attempting to update designs of helmets for Asia-Pacific region fire brigades. The current Standard sets lateral vision and other design restrictions that are not easily avoided by modern helmets with internally rotating face shields.

On the other hand, the new edition of EN 443 establishes two types on helmets (A & B) and these allow traditional style Type A helmets to cover less of the head than Type B helmets which must come down further around the head and provide much greater shell cover. These designs should mean much improved thermal and impact protection for fire fighters.

But the other huge change to EN 443:2007 is the addition of a flame engulfment test similar to test that can be applied under Annex E of EN 469:2005 to clothing certified to that standard. This is a major change that could well see a significant number of existing helmets off the market, or certainly requiring major sub-components upgrades. The test involves kitting a torso in full EN 469 jacket, SCBA mask, hood, and helmet complete with face shield, neck protector and Nomex chin strap. Because the flame and heat is directed both at the jacket as well as directly at the lower edges of the helmet for 10 seconds, the flame and heat rises from under, around and potentially inside the helmet. The Standard requires the temperature at the tip of the burners to be  $950 \pm 50^\circ\text{C}$ .

This is a very serious test. Without major changes, many existing EN 443 helmets will simply not pass this test, and it would be interesting if some impact tests or flame tests were

subsequently conducted on these helmets. For those with polystyrene impact liners, injected plastic shells or combustible internal materials will almost certainly fail.

An actual video of this test can be viewed on [www.pacifichelmets.com/flameengulfment/](http://www.pacifichelmets.com/flameengulfment/)

Most front-line fire crews will be grateful for the addition of this test to the Standard, as flashovers are comparatively common and pose a real threat to rescuers in many structural fire situations.

The other major complication for manufacturers has been the introduction of EN 14458:2004. This Standard established new tests for face shields and eye protectors on fire helmets, but appears to have had what can best be described as a very poor consultation process. While this document sets out to test face shields on fire helmets, it gets further into deep water by bringing in tests of a much wider range of design aspects of the helmet including ergonomics. These tests have little to do with face shields and in the view of the CEO of Pacific Helmets New Zealand David Bennett, the requirements of this document should have been considered for inclusion in the rewrite of EN 443.

Among a significant number of drafting errors, the writers of this Standard overlooked or forgot about the practical size and dimensions of face shields for real fire helmets. The result has been a requirement for face shields that are so large they virtually extend down to cover the wearers navel! This and other aspects of the document are currently under review by the CEN committee and will hopefully be resolved quickly.

The other major concern for Asian-Pacific fire fighters is the fact that the vast majority of tasks they face are nothing to do with structural fires but much more to do with RTAs, rural fire fighting, line or water rescues, paramedic operations and even rescuing cats out of trees. Heavy, bulky, inconvenient helmets simply get removed when conducting many of these tasks and fire crews are looking for vastly better designs.

Pacific Helmets New Zealand recently introduced a number of extremely innovative helmet



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designs and many of these are already certified to AS/NZS4067. For instance the F9 model is a traditional shape 3-layer helmet that begins with a simple and compact Level 1 helmet suitable for RTA/USAR operations, as well as rural fire fighting. This helmet is personal issue since every fire fighter must wear one, but the second layer over-shell (L2) is only truck issue and can be shared between shifts.

Reducing the number of structural helmet components significantly reduces the cost of the total helmet costs for fire brigades, but the concept needs to be understood by both brigades and unions to obtain acceptance. Once everyone understands the significance of wearing a light 800gms convenient helmet for 90% of the time, the concept catches on.

The L1 helmet is also designed to be worn inside fire appliances while travelling at speed to call-outs and to provide full head protection in the event of an accident. Road accidents are actually the most common cause of death and injury to fire crews in Australia and New Zealand.

A third level of Kevlar reinforced over-shell is available for use in hot fire training schools and this protects the L1 and L2 helmet from smoke and unnecessary damage. Again, this third shell is shared between trainees at fire schools, is sacrificial but is designed to prevent unnecessary damage to operational helmets.

A similar model in a semi-jet style helmet is also available in the F10AS helmet. This stylish helmet can have an internal eye protector and an external face shield. It is actually a variation of a multi-level jet-style helmet and is already both AS/NZS4067 and EN 443 certified. Of greatest interest to individual users is the fact that this helmet can weigh as little as 1150gms including face shield and neck protector.

Pacific Helmets plan to announce a 2/3-level variation of the F10 jet-style helmet early in 2008 that not only has a Kevlar reinforced shell and full cranial impact liner, but with combined L1 & L2 weight as low as 1350gms. Again, the base L1 helmet weighing 800gms is designed for non-structural fire operations but with the addition of a strong outer Kevlar shell is still useable as a

structural fire helmet. By simply dropping on a the second shell (which is accomplished without even removing the L1 helmet from the head), the combination complies with AS/NZS4067, EN 443:2007 and EN 14458:2004. assuming face shield design issues are resolved in the latter document.

The very interesting technical aspect of multi-layer helmet designs is the fact that they provide superb impact and thermal protection. Top impact protection calculations show that multi-layer Kevlar shell helmets have 40% lower impact readings compared to single shell helmets.

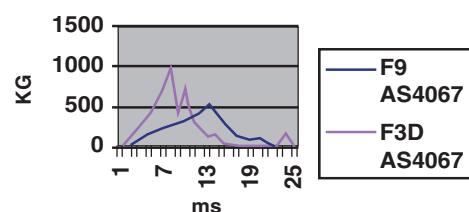
Furthermore, while Kevlar shell/full impact liner helmets have virtually only 1.5–3°C temperature rises in EN 443 tests, the multi-layer helmets have zero temperature rises compared to the 25° increases permitted. But who wants to have a 25° temperature rise in their helmet anyway? With these sorts of test results the test is already irrelevant for high quality helmets.

These developments typify the difficulties facing Standards committees. Safety helmet development is proceeding so quickly that it is almost impossible for committees to keep up and manufacturers at the forefront of their game are driving designs forward very quickly. Traditional helmet designs like those typified by many old US and European designs may have held sway, but safety conscious brigades are looking for superior design options that offer their crews lighter-weight, more innovative helmet designs and most importantly, greater safety.

The issue for some Asian fire brigades is that historical helmet protection levels have been so low as a consequence of protection afforded domestic manufacturers who have manufactured extremely low specification helmets. This is not true of all brigades, for the Hong Kong, Singapore, Taiwanese and some Korean fire brigades have been equipping their crews (both fire and paramedic) with EN 443 compliant helmets for some years. This trend is becoming more common in both South Asia and the Indian sub-continent. The result will be a significant reduction in head trauma.

For many of these countries, the real issue in the first instance is one of raising the basic helmet and PPE performance standards. Whether they chose European CE or AS/NZS Standards, the benefits will be similar and front-line crews will be the beneficiaries. For other fire brigades in Australia and New Zealand, the traditional shape of helmet is likely to change to half or full jet-styles as the Standards document updates hopefully next year. With multi-function/multi-layer helmets now becoming available, stand-by for quite radical design shapes and features on fire fighters heads very soon. **IFF**

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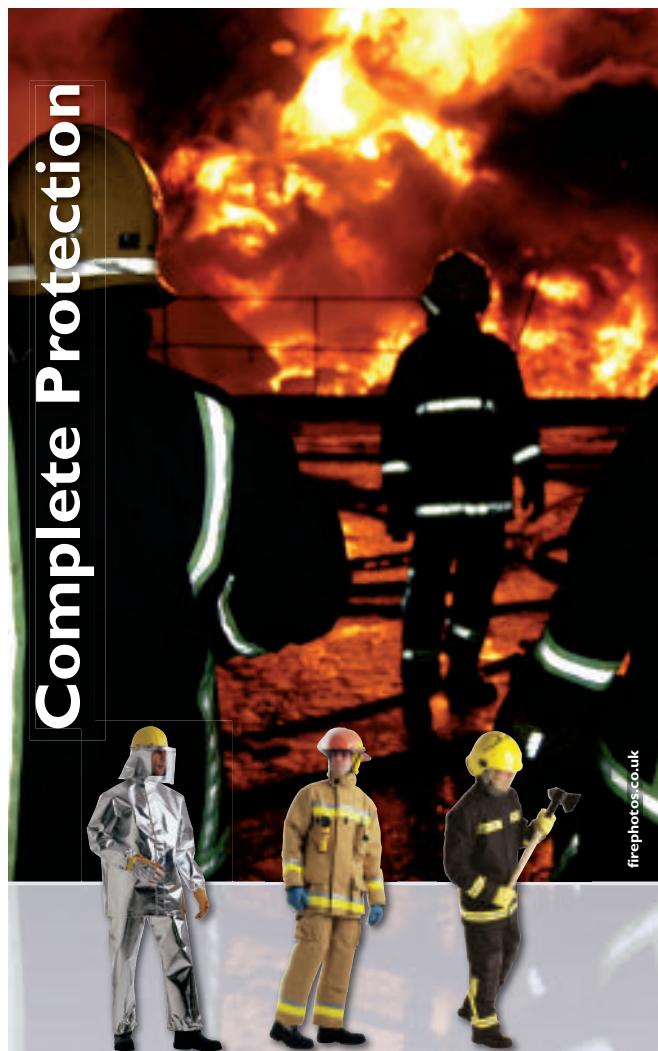
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# Global Fight, Local Solutions

Just as cultures, architecture and language differ in each part of the world, so do fire fighting pumps. Bucket brigades, the universal and long entrenched standard for transferring water from the source to the fire, eventually gave way to modern innovations that better served the needs of each world region.

**By Tim Schanno**

Waterous Area Sales Representative, Asia, Australia and Oceania

Today, there are but a handful of mobile fire pump manufacturers worldwide. Although there is a vast differentiation in technology between these manufacturers, the centrifugal fire pumps they produce generally work on the same principles. And, depending on what region of the world the fire brigade is based in will typically determine whether a single-stage or multi-stage vehicle mounted fire pump will be used.

## Rear-Mounted High/Low Pumps: Europe and Asia/Pacific

Most European and Asian communities use rear-mounted, simultaneous (multi-stage) pumps, referred to as High/Low or HL pumps. A popular choice due to the smaller chassis design that is common among apparatus manufactured in these regions.

HL pumps are specifically designed for this type of application and are mounted on the rear of the apparatus, with the intake and discharges also facing the rear. This allows the remainder of the

vehicle to be used for lockers that can house additional rescue and firefighting gear. The rear access design also keeps the sides of the apparatus clear, which makes pump operations in close quarters much more efficient. This is one of the key features that make the HL pump a popular choice for these regions.

Though compact, the HL loses nothing in performance due to its size. In fact, for this type of application the pump's operation allows for both low pressure (10 bar) with high water volume and high pressure (40 bar) with low water volume operating simultaneously. The basic range of the HL pumps is anywhere from 2,000 l/m to 5,000 l/m.

Typical HL pumps are designed as a two-stage pump featuring one common impeller shaft with two impellers. The first stage is the larger, high-volume stage. The second stage is the high-pressure side. Ideally, HL pumps use a two-impeller design, but some manufacturers choose to use multiple stages in order to develop the high pressures.



HL pumps are typically driven via the chassis power take off (PTO). The kW requirements vary by manufacturer and also depend on what water flow and pressures are required. When specifying an HL pump, check to make sure that the chassis/transmission/PTO will allow the required amount of torque and kW needed to perform your firefighting operations efficiently.

HL pumps should also be equipped with an overheat protection device, since these pumps run at high pressures for extended periods of time with little or no water flow. The water inside the pump will rapidly heat up and when an operator discharges the water he/she can get injured from the scalding water. With an overheat protection device, the system will alert the pump operator to this condition, while also discharging a small amount of water to keep the pump cool and in safe operating condition.

In addition to an overheat protection device a discharge relief system is also critical to safe operations. HL pump priming systems are automatic and must be capable of deep draughting. Due to the high operating pressures that may be achieved by this type of pump, a discharge relief system should be incorporated into the pump design. These are internal, require no adjustment and provide a margin of safety for the firefighter when operating the hose line.

#### **Mid-Ship Multi-Stage Fire Pumps: Asia/Pacific and North America**

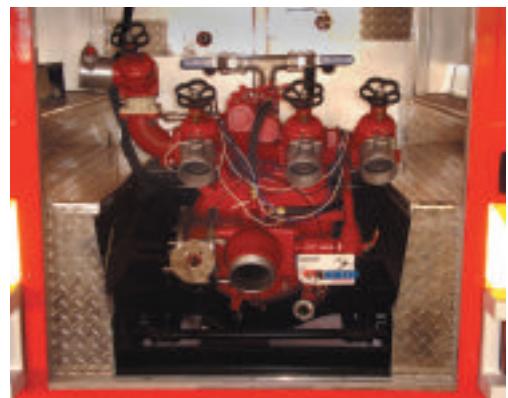
Another popular pump design that is used both in the Pacific Rim and North America is a mid-ship style pump. Mounted in the middle of the chassis or just behind the passenger compartment, the mid-ship pump features intake and discharges on both the near and far side of the vehicle. This type of pump is generally capable of 8,000 l/m at 10 bar and additionally features a second stage

capable of pressures in excess of 40 bar in series operation. Some manufacturers will also carry a pump with a third stage that can boost pressures in excess of 55 bar with flows of 16 l/m.

These mid-ship, multi-stage pumps use a transfer valve during operation. When the transfer valve is in the VOLUME (parallel) position, the water enters each impeller eye from a common intake and leaves through a common pump discharge. When the transfer valve is in the PRESSURE (series) position, the first stage discharges its full volume and pressure directly to the second stage intake, instead of discharging its full volume and pressure directly to the second stage intake, instead of discharging out to a hose line. The second stage then moves this same volume of water, but at the pressure of the first stage discharge.

This type of design is very efficient, since it does not require a mechanical reduction of water pressure. In fact, very little water pressure is lost using this method.

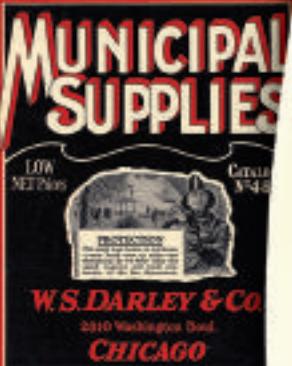
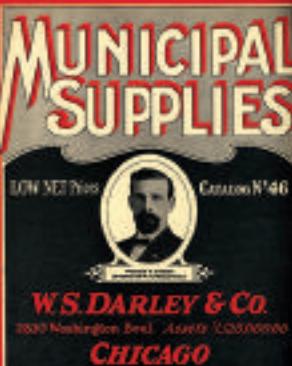
Mid-ship pumps are driven via a split shift PTO,





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In 1926, the fire truck market was dominated by a handful of large companies that manufactured high end fire trucks on their own hand-built custom chassis for about \$4,000 - \$5000. My grandfather saw an opportunity to expand his manufacturing operations. He approached Henry Ford and signed a deal to build one of the first commercial pumper on a Ford Model A chassis and offered it at a price under \$1,000. Communities across the USA rushed to purchase these economical pumpers.

In 1932, Darley's fire apparatus manufacturing operations were booming in Chicago. In response, other fire apparatus manufacturers collectively put pressure on the fire pump manufacturers not to sell Darley a pump. In response, W.S. Darley hired the chief engineer of one of those companies and set up pump manufacturing operations in Chippewa Falls in 1933.

Look for future publications which will feature our next 25 years of Darley history: years 1934-1958. If you can't wait, check out our website for a catalog archive and other historical information at [www.darley.com/100years](http://www.darley.com/100years).

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manufactured by the pump supplier. Split-shaft PTO's allow 100% of the available kW and torque provided by the chassis engine. Most models will feature a switch in the driver's compartment that will allow the operator to switch the pump to ROAD when driving, and when operating on the fire ground the switch will be in the PUMP position. This in effect disengages the drive wheels of the chassis and supplies full power to drive the pump. Two types of drive mechanisms are used for this PTO. One style is driven by a large 64-mm chain, which can handle more than 23,000 Nm of torque. The other style of drive is a gear drive, and depending on the manufacturer, it will have either a two or three gear set.

Chain drives have a distinct advantage over the gear drives, from the standpoint of noise. The chain drive is hardly audible to the ear when the pump is engaged, whereas a gear drive will have a distinct gear whine that is quite loud when



in operation. This can be critical if you have hearing protection regulations.

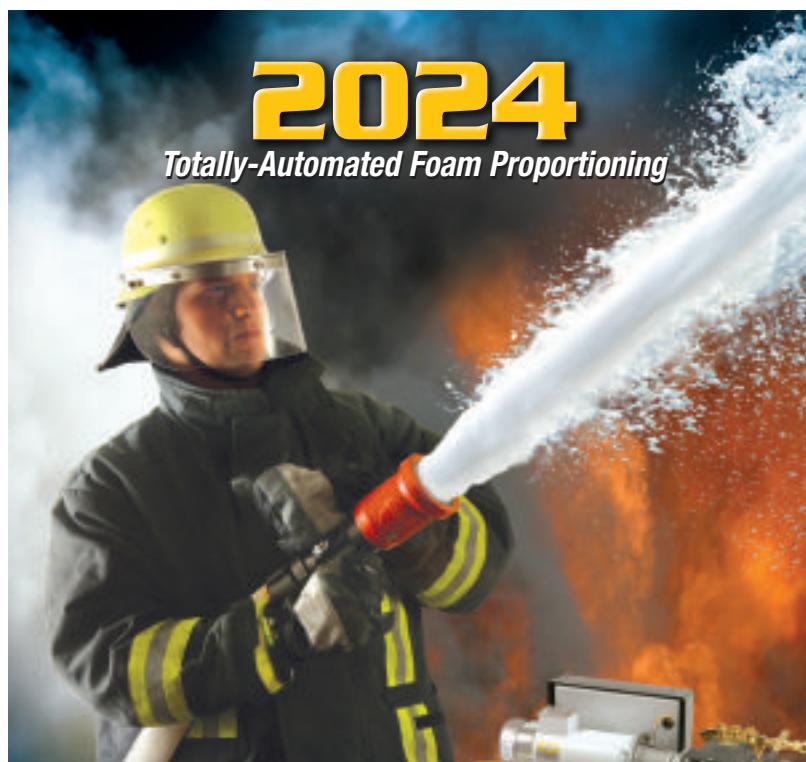
Mid-ship pumps offer the same advantages of the HL pumps and a few additional ones. They allow larger water flow volumes at the same or higher pressure ranges. They can also be equipped with pressure relief systems that are adjustable to suit fire ground operations. For instance if you have several hose lines and an un-manned monitor flowing, and for some reason the monitor was shut down, the hand lines may still operate at their same pressure. The pressure relief valve will

**Don't buy a pump just because it is less expensive, it may cost you more in the long run. Remember fire pumps save lives and when it comes to saving lives you want the most dependable pump backing you up.**

compensate when the monitors water flow is stopped, the valve opens and allows the monitors water to flow back into the intake side of the pump and not cause the hand lines to increase their water flow and pressure.

The pump operator typically operates priming systems on the mid-ship pumps manually. This is achieved using a rotary vane primer motor and a manual-priming valve.

On both the mid-ship and HL pumps manufacturers like Waterous use a process called "flame-platting" on the wear surfaces of the impellers. This process helps prevent normal wear and tear due to fine sand and grit in the water



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systems or when drafting. Flame-plating is a process by which the impeller is plated at a very high temperature with liquid tungsten. Once hardened this makes the wear surfaces of the impeller nearly indestructible. When specifying a pump make sure you specify one with a flame-plated impeller, it will reduce downtime and save you from maintenance headaches.

#### **Self Contained Pumping Unit (SCPU): Asia/Pacific Region**

The SCPU pumps are very much like a portable style pump . . . but on steroids. The SCPU has its own petrol engine to drive the pump and easily carried by two or more firefighters. These pumps are used as a primary pump or as a back-up pump in most cases. They are capable of large flows and high pressure depending on the model and manufacturer your specify.

Advantages to this style of pump are many. They are small, compact and extremely powerful. Typical SCPU's weigh less than 160 kg, while at the same time able to deliver in excess of 1,600 l/m and 20 bar. They feature automatic priming very similar to the priming systems found on HL pumps. With a small chassis they may be used as a first attack vehicle in rural or smaller communities or as a backup unit in the city. Although small in size you shouldn't underestimate the capabilities of these little guys. They will fully support two 64 mm discharge lines in excess of 300 meters, with good flows and pressures. Depending on the manufacturer they may be liquid cooled for extended run period in the tropical areas.

#### **Making Smart Decisions**

Take a look around at all the pump manufacturers and you will find that there are differences in innovation in each one. And even though a centrifugal pump is still just that, the efficiencies and operation have changed significantly. That makes choosing the right tool for the job all the more important. Don't buy a pump just because it is less expensive, it may cost you more in the long run. Remember fire pumps save lives and when it comes to saving lives you want the most dependable pump backing you up.

Serving in the fire service industry for over 18 years, I saw my fair share of misused applications of fire pumps in expensive vehicles because they didn't do their research. Make sure your vehicle committee doesn't make the same mistakes, do your research or talk to a professional who can walk you through the specification process. You and your department will be glad that you did. **IFF**



A group of six people, four adults and two children, are standing together against a solid yellow background. They are dressed in casual clothing. In the foreground, large white text reads "MANY THANKS FOR DEDICATING YOUR LIFE TO SAVE OURS."

To be really efficient in an emergency situation, it takes skills, a great deal of self-control, courage, and especially, the right equipment.

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A detailed photograph of a red and black industrial fire pump unit. The pump is mounted on a metal frame and features various mechanical components, including a pump body, a motor, and piping. It is set against a yellow background.

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# Remote-Controlled Monitors for Firefighting Vehicles:

## Choosing the Right Monitor for Your Needs

Selecting the right remote controlled monitor for a firefighting vehicle can be difficult, but is vitally important for many reasons. Equipping the vehicle with right monitor (or monitors) for the job requires an analysis of a number of considerations. Given the many brands on the market, how can one make sense of it all?

**By Roger Barrett  
James, B.A., J.D.**

Director of International Sales & Marketing,  
UNIFIRE AB

Like any professional equipment buying decision, when selecting a monitor it is important to take a careful and objective look at your needs. Selling and marketing points offered by competing monitor manufacturers can make this process seem more complicated than it has to be and can lead you astray from selecting a monitor based on your bottom-line needs.

The firefighting monitor is designed for the primary purpose of allowing firefighters to reliably and effectively control a large volume of water, foam, or dual agent through a nozzle, onto the fire, while working under stress. Focusing on each of these elements of the primary purpose can help you think about what's really important when selecting a monitor.

**Firefighters:** Like all professionals, today's firefighters come to the job with varying ranges of skill, experience and training. For this reason, any monitor selected should be intuitive and easy to

use by all firefighters in the brigade.

**Reliability:** Reliability of the monitor is crucial. After all, the monitor will need to serve the brigade for many years and must perform well when there is a fire. Selecting a monitor of high quality, and thus high reliability, is therefore extremely important and can actually save money.

Some questions to consider that will help determine the quality of a monitor include:

- Is the material from which the monitor is made robust and resistant to corrosion, dirty water, chemicals, salt water, etc.?
- Is the monitor easy to install?
- Is the monitor low maintenance?
- Is it easy to replace components, such as the control box, joysticks, cables, motors, etc.?
- Are spare parts readily available?
- Do the electrical connection points have multi-connectors (screw-on, screw-off connections), making it easy to troubleshoot issues



and to replace cables and components when necessary?

- Does the monitor have "soft-stops" (i.e., software that, after the initial calibration, tells the monitor to stop just before hitting the end limits), which substantially reduce wear and tear on the gears and motors?
- Are all moving parts and electrical connections well concealed and protected from the environment?

You can also gain some insight into the overall quality of the monitor by looking at the quality of the monitor's welding. High quality welds can be a sign of high quality craftsmanship in the manufacturing process. Performance of a monitor, of course, is also a key indicator of quality.

When it comes to cost, a high quality, well-designed monitor will lower the total cost of ownership despite the initial higher price tag. This is because the initial cost of a monitor is only a fraction of the total cost of owning it over its lifetime if you take into consideration a number of very real secondary costs such as installation, maintenance, servicing, repairs, vehicle down-time, costs of replacement parts, etc.

For all of these reasons, it is advisable to select a monitor that is of high quality and is designed in a way to reduce the total cost of ownership.

**Effective Control:** Ultimately, a monitor's control system is one of its most important features. The ability to easily and accurately control the stream as desired provides the firefighter with his best chance of efficiently attacking the fire.

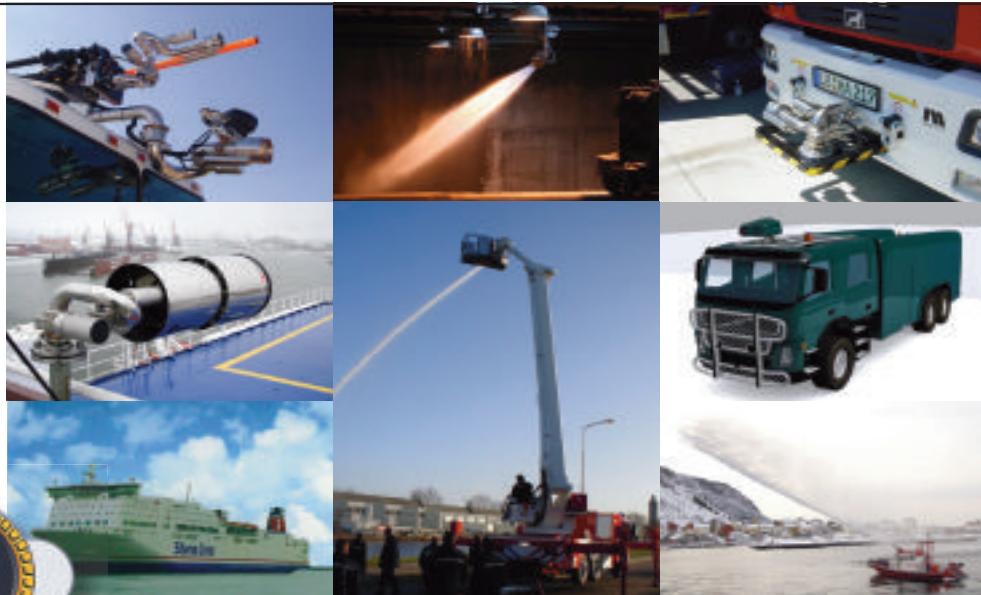
Control systems, coupled with the design of the monitor and the system as a whole, vary in their combined abilities to control the monitor's movement (up-down, left-right), the nozzle's spray pattern (from jet-to-fog), and peripheral devices, such as valves, lights, cameras, etc. An ideal

monitor control system gives the firefighter the maximum ability to control these things in a simple and intuitive way.

**Range of Motion:** One consideration is the monitor's range of motion in light of the physical limitations of its range imposed by the way the monitor is physically mounted on the vehicle. A monitor with a horizontal range of 360 degrees and a vertical range of 180 degrees provides full spherical coverage. But that range will have to be limited physically to prevent the monitor from pointing at the vehicle or other objects that might be in its way. For this reason, the monitor must also have adjustable end position points, also known as "hard stops." Typically, this is achieved by bolts that can be placed at various positions to stop the monitor from moving further in its direction. The greater the number of positions available for hard stops, the better, because this will maximize the total range of motion you can achieve with the monitor as it is mounted on your vehicle. It's a good idea to check with the monitor manufacturer to be sure that the range of the monitor in consideration is at least as great as can be accommodated by the vehicle and, if greater, can be limited as close as possible to the maximum range the vehicle can accommodate.

**Speed and Direction Control:** The ability to control a monitor's speed is also very important because the farther the monitor is from the fire, the faster the stream moves at that distance. A control system that provides the ability to move the monitor both quickly and slowly, therefore, provides added accuracy. For this reason, it is a good idea when selecting a remote-controlled monitor to consider its ability to be easily controlled at varying speeds. Ideally, the control system will be "progressive", meaning the harder you press the joystick or control in a given

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Size (Dimensions) and Weight		
Monitor Material (Stainless Steel, Aluminum, etc.)		
Maximum Pressure and Flow		
Max. Reach at Max. Pressure/Flow		
Range of Motion (Horiz./Vert.)		
Adjustable Mechanical Hard Stops? How many?		
Does the monitor have Soft Stops? Are they self-programming?		
Progressive speed controls (slower-to-faster)?		
Valve Control Button?		
Simple-to-use record and playback feature?		
Easy-to-use Joystick/Control Panel (including with gloves on)?		
Can 2 joysticks be used with this monitor (e.g., one inside cab and one outside vehicle)?		
Wireless Remote Optional?		
Position Feedback Control ?		
Long joystick cable option, for operating at a distance from the truck?		
Multi-connectors on all cable connection points for easy installation, troubleshooting and on-site repair?		
Can controls be integrated with the vehicle (such as CAN-bus protocol)?		
Warranty Period?		
Return/Trial Policy?		
Serviceability / Parts Available?		
Easy to Install?		
Easy to trouble-shoot.		
Maintenance Requirements?		
Easy to replace primary components (e.g. motors, joystick, cables, etc.)?		

direction, the faster it will move that way, and the softer you press, the slower it moves. Consider also whether the monitor can be moved diagonally (e.g., two directions simultaneously, such as up and left), which provides a higher level of intuitive control than systems that can only move in one direction at a time. Unifire's progressive joysticks, for example, allow you to press the joystick shaft in any direction, including at diagonal angles, and the monitor will follow in the same way.

**Optional Control Devices:** Some monitor manufacturers offer optional position-feedback controls systems to allow the firefighter to know how the monitor is positioned even if he cannot see it, such as when it is mounted the vehicle's roof and operated from inside the cab. Some monitors can also be controlled by more than one control device at a time, such as by two separate joysticks (e.g., one in the cab, and one accessible from outside the vehicle) or by a standard joystick as well as a radio remote control. This feature adds flexibility to control the monitor from multiple locations, and also provides a backup in case of a joystick breakdown. Monitor systems also vary in terms of the maximum length you can run a joystick, and if the ability to have a long joystick cable is important, be sure to ask the monitor

manufacturer about the maximum length of the joystick cable.

**Nozzle control:** Regarding nozzle control, look for systems that allow maximum control of the nozzle including adjusting the spray pattern from jet to fog and everything in between.

**Record and Playback:** Record and playback features can be helpful in some circumstances. Some monitors, such as Unifire's Force™ monitors, for example, also allow the operator to record everything he is doing (including speed, direction, pauses and even nozzle control) for a period of time by pressing a record button, and then play that back in a continuous loop, allowing him to work on other things while the monitor keeps working on its own in the exact pattern recorded by the firefighter. To be effective, however, a record feature should be very simple to use under the stress of a fire.

**Large Volume:** For firefighting trucks, monitors typically range from approximately 1000-6000 litres per minute (265-1585 gpm). In general, the more water, foam or agent you can deliver onto the fire, the better. When choosing a monitor, consider the maximum capacity of the vehicle's pump and the volume of water available. The monitor selected should efficiently handle the flow



and pressure that can and will be provided to it.

**Water, Foam, or Dual Agent:** The monitor and nozzle selected should be compatible with the type of water, foam or agents that will be used. If harsh agents, foam solutions, or salt water or dirty water will be used, then it is important to select a monitor and nozzle that are made of materials that are highly-resistant to corrosion, such as stainless steel (type 316) or equivalent. It is a good idea to take the time to understand the material from which your potential monitor is made.

**Nozzle:** Nozzle designs vary widely. The type of nozzle will depend on the application and whether the monitor is to be used with water, foam, or dual agent. In general, it is important to consider whether the proposed nozzle's flow is adjustable (so as to match the flow the vehicle will provide), whether its spray pattern is continuously adjustable from fog to jet, and whether the wires, motors and all moving parts are well protected from the elements. If foam is to be used, consider whether you have particular expansion requirements and whether the foam attachment is compatible. Some monitor brands can accept nozzles made by other manufacturers, so if you like a particular brand nozzle, but prefer a monitor from another manufacturer, ask the manufacturers whether they are compatible with each other. It is also beneficial to select a nozzle with a wide-angle fog pattern, which can protect the vehicle from the fire when necessary.

**Working Under Stress:** When it comes to fighting a fire, there will always be a significant element of stress. The high level of stress, combined with the urgency of acting very quickly, make it crucial to work with equipment that is easy and intuitive to operate and which requires a minimum of thinking to control. So, while considering the variety of features offered by various monitor manufacturers, be sure to also think about whether the equipment will be useable, as a practical matter, under the real pressures of fighting fire. If the monitor is difficult to use under pressure, it can increase the level of stress the firefighter experiences, making him less effective.

The principles, above left, can help guide you in

the selection process. It can also be helpful to gather the following pertinent information from the manufacturers of the monitors you are considering. Then, compare the answers and rank the monitors in terms of which best provides the features that are most important to the needs of your brigade.

Understanding the above principles and monitor features can help you narrow your focus and select the best monitor for your brigade.

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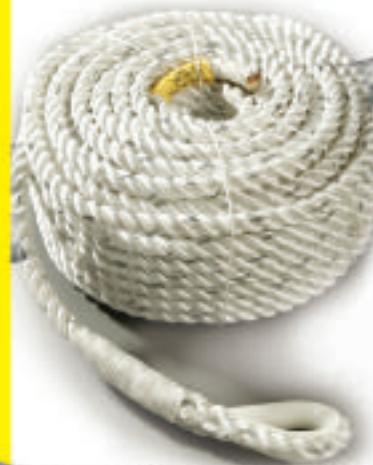
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# Breathing Apparatus:

## Looking To The Future With A Modular Approach

With one of the most difficult and dangerous jobs in the world, today's firefighters deserve the very best levels of protection. Unfortunately, because no two "shouts" are the same and the hazards are diverse in nature as well as in their extremity, the provision of the right equipment at the right time is often easier said than done.

**By Greg Barber**

Product Specialist,  
Draeger Ltd

**W**hether responding to a chemical spill, a warehouse fire or a suspected terrorist attack, the requirements for protective equipment differ at every incident and can change without warning. For this reason, more and more brigades are looking for increased modularity in the design of their breathing apparatus and associated equipment, as well as better communications and entry control procedures.

New to the market, Draeger's complete system solution for firefighters is a prime example of the way in which modularity is revolutionising firefighter safety. Combining a modular design with state-of-the-art technology, it brings a completely new dimension to personal protective equipment by incorporating the latest in compressed air breathing apparatus, full face masks, head-up

displays, quick cylinder connection, electronic monitoring and entry control capabilities, as well as customised training. For maximum flexibility, the system can be put together as a series of mix-and-match components to meet different operational requirements.

Greg Barber, Product Specialist at Draeger Safety explains, "Firefighters are often required to work in the most extreme environments and although the conditions may be unexpected and uncontrolled, the risks can be significantly reduced through effective training and safety preparedness. Wherever the threat occurs and regardless of the form it might take, if firefighters are trained to deal with the unexpected and have the right equipment to help them to overcome the hazards they might face, their safety can be significantly improved."



He continues, "Designed with the needs of firefighters in mind, the Draeger PSS 7000 Breathing Apparatus can be used with the new Draeger FPS 7000 Full Face Mask to bring a pioneering, total solution that offers maximum protection. Seamless integration with other firefighting essentials, such as the new PSS Bodyguard 7000 and PSS Merlin entry control systems are also possible. In addition, the new FPS 7000 Head-Up-Display can be linked into the system, as can the fast, efficient Cylinder Quick-Connect option. Training, which can be customised to meet exact needs, can then be added as a final component in the fight to keep firefighters safe."

Benefiting from Draeger's extensive knowledge and experience in the design and manufacture of ergonomic, comfortable and high performance breathing apparatus, the system also boasts advanced pneumatics. In addition, the effortless assembly and disassembly of all major components means that not only can the system be configured rapidly, but easy care and maintenance will guarantee quick turnaround times in the workshop and, as a result, ensure that every part of the system is always ready for use.

Modern systems such as these are designed to maximise comfort and minimise both stress and fatigue. For instance, the PSS 7000 features a new harness with advanced compression moulded comfortable padding that combines high temperature performance with exceptional wear resistance. A high grip, anti-slip surface ensures that the harness stays in position and the set remains secure on the body, whilst a quick release mechanism on both the waistbelt and shoulder harness allows quick and easy detachment for easy cleaning and maintenance.

The high performance sets also recognise the

operational needs of firefighters and, as a result of extensive user research, the PSS 7000 is adjustable and robust with new heavy duty stainless steel strap buckles to ensure long life and easy operation when donning and doffing. In addition to shoulder pads and waistbelts which feature a new quick release mechanism for easy maintenance, the set also incorporates new hose sleeves on the shoulder harness which are covered with reflective material to increase visibility and, at the same time, provide additional hose protection and minimise the risk of snagging.

Further enhancements include a 3-point height adjustment and a lightweight, high strength carbon composite backplate that incorporates further integral hose channels to reduce snagging and offer improved protection. Large carrying handles have also been integrated for better handling and safety, and a new patented slide and swivel waistbelt mechanism ensures correct positioning on the body.

To be truly functional, modular components must also be totally compatible. Fully compatible with the PSS 7000 as well as the Draeger HPS 6200 Helmet, the new FPS 7000 full-face mask follows this modularity/compatibility focus.

Developed as a result of user consultation and representing a new standard in terms of safety and wearer comfort, it combines an ergonomic design with a large field of vision and a secure fit that feels both comfortable and natural to wear. Offering more flexibility than ever before with a wide range of modular, integral attachments, this robust, easily maintained mask is also available in a variety of sizes and can be fitted with the new Draeger FPS 7000 Head Up Display.

This user-friendly option can be quickly and easily inserted or removed from within the full face mask. Protected from the ambient atmosphere and featuring a wireless design, it allows firefighters to view their real-time cylinder content automatically, leaving their hands free for other tasks.

The nature of the work demands that modern masks feature a distortion-free polycarbonate visor and offer an exceptionally wide field of vision. An innovative design feature in the FPS 7000 also maximises air circulation within the mask to eliminate misting, and a number of different coatings are also available to meet every eventuality. Ensuring a secure, comfortable fit for all face shapes and contours, the uncomplicated 5-point head harness allows the mask to be donned and removed both quickly and easily. In addition, and specifically for those who prefer to use mask-helmet combinations, a new 2-point Draeger Q-fix connection, complete with safety button to prevent unintentional releases, ensures that the mask can be quickly connected to the HPS6200 Helmet.

For more effective communication and as part of the modular approach, the mask can also be supplied with the new, integral Draeger FPS-COM communication system. This state of the art, modular system can be easily adapted to suit specific needs, whether for radio communication or voice amplification.

Greg Barber continues, "In addition to modularity, the future of BA lies in the provision of information, both to the wearer and his or her supervisors. This is why monitoring units such as the Draeger Bodyguard have been so well

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received. Providing essential data and able to be linked to telemetry systems, they provide vital information, in real time, and bring greater visibility as well as safety to every BA wearer."

Boasting advanced technology, Draeger's new Bodyguard 7000 electronic signal and warning unit, for instance, provides continuous monitoring of the operational status of both the firefighter and the BA. However, its functionality has been carefully twinned with ergonomic design features aimed directly at improving firefighter comfort and performance.

For example, the unit not only ensures balanced distribution of weight by incorporating the pressure sensor and power supply modules into the backplate of the BA, but it also means that the electronic gauge can be compact as well as lightweight at approx 300g. Utilising simple, user-friendly push button controls to provide fast access to essential information, the gauge incorporates a highly visible LCD display that provides accurate and continuously updated data in an easy to read format.

This includes time-to-whistle, which is calculated on current air consumption and is refreshed every second, digital pressure reading in bar, a simulated analogue gauge and temperature indication. With integral ADSU and Distress signal alarms, it also performs automatic self tests and system tests and emits both visual and acoustic alarms. For maximum flexibility, it is also offered with a choice of operating modes: Tally and Automatic.

"Reliability and ease of use is still of paramount importance" adds Barber. "Built for use in extreme conditions and assuring good visibility even in poor lighting, the Bodyguard features large information icons for immediate comprehension, text information such as user id and text alerts can be scrolled. Located in the backplate, the power supply module can be easily and quickly replaced

in the field and is available as either an alkaline AA battery pack or a lithium ion rechargeable module.

"Of particular benefit is the fact that each Bodyguard 7000 can now be programmed to identify the user and/or the Brigade automatically. Prior to use, the user simply uploads his or her personal ID, wirelessly, using a personalised pre-programmed ID card. Parameter settings and datalogging can also be performed easily via a wireless link to the new Draeger PSS PC interface module via standard USB connection and specially designed software can also be used to tailor the unit to individual requirements or to download and analyse datalogs as and when required."

When this type of equipment is coupled with telemetry in an entry control application, for example, firefighters are given a very powerful ally. He adds, "For the first time, all of the information monitored by the unit during its use can be viewed externally in real time. Showing just what the firefighter has come up against, how quickly he/she is breathing, and so on, it equips entry control officers with essential knowledge. Systems of this kind, such as the Draeger PSS Merlin take the guesswork out of entry control procedures and enable the right decisions to be made about particular firefighters as well as rescue teams."

Fast and accurate, the Merlin incorporates an entry control board, the Bodyguard and a portable radio unit attached to the firefighter's BA set. Using radio technology to continuously transmit and receive data from up to 12 individual firefighters simultaneously, this self-contained system remotely monitors their exact status and safety from outside the incident.

Meeting the requirements of TB1/97 and JCDD40, the transponder based control board is based on the standard UK control board with additional electronic displays. Fully automatic and able to support rapid deployment procedures, it provides one continuous display channel for each firefighter simultaneously, with full manual back up if required.

Firefighters log on individually by removing the tally from Bodyguard and inserting it into the control board. They are then allocated a specific channel and two-way communication is established immediately. Each channel displays an on-line signal, ADSU alarm signal and evacuation and withdrawal signals. These signals can be given, received and acknowledged by the BA wearer or Entry Control Officer.

The Entry Control Officer can select whether to view time to whistle, time of whistle, cylinder pressure or temperature, and additional data can be displayed according to requirements. Group and individual evacuation commands are also supported by a separate voluntary withdrawal facility and, in the event of a radio signal being lost, audible and visual warnings will alert both the BA wearer and Entry Control Officer.

Barber concludes "By taking a modular approach, brigades are automatically building flexibility into their systems and, with a job that changes second by second, flexibility has to be a key element in maintaining a firefighter's safety. Couple that with improved communications and real-time reporting on actual situations and brigades can seriously improve the comfort, performance and safety of their firefighting teams." **IFF**  
PSS, Bodyguard and Merlin are registered trademarks

**Further information is available from:**  
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# Ongoing AES' efforts to handle the New Larger Aeroplane at Changi Airport

A new chapter of aviation history was written on 25 October 2007, when the inaugural commercial flight of the world's largest passenger airliner, the Airbus 380 (A380), took off from Singapore Changi Airport to Sydney, Australia. Behind that historic moment lies years of planning, detailed studies, consultations with stakeholders and modification works to the airfield and airport.

**By Ang Siew Min**

Chief, Airport Emergency Service, Civil Aviation Authority of Singapore and

**Edwin Lim**

Staff Officer (Operations Planning), Airport Emergency Service

**C**hangi's planning philosophy has been to ensure that airport infrastructure and services are ready and in time to meet new aviation requirements. The Aircraft Rescue and Firefighting (ARFF) Service – better known as the Airport Emergency Service (AES) in Singapore is an integral part of the airport's operations, without which flight operations would not be possible. AES' planning activities commenced as early as end-2003, resulting in the formation of the AES A380 Preparatory Action Group that prepared for the A380's commencement of services.

To meet the principal objective of saving lives, robust and effective training has always been at the forefront of our operational priorities. Our

planning regime does not stop with the successful launch of the first commercial flight of the A380. In fact, this event serves as an added impetus for AES to enhance our training programmes to better prepare our officers to deal with any incident involving an A380 aircraft.

## Familiarisation of the A380

Even before its maiden commercial flight, Singapore had played host to the superjumbo four times. These four trips had given AES officers the opportunities to carry out compatibility trials of our new equipment on the aircraft. In addition, officers took the opportunities to familiarise themselves with the operational aspects of the aircraft,



such as the opening of cargo compartment doors and emergency exits. More importantly, they could see for themselves the challenges posed by the size and different layouts of the aircraft.

Singapore Airlines has ordered 19 A380 aircraft and took delivery of its first aircraft in October 2007. AES officers have made conscious efforts to conduct regular familiarisation visits to the aircraft when it is docked for maintenance.

#### **Aircraft Virtual Interior Simulator (AVIS)**

The AVIS was first developed and commissioned into our training curriculum in 2002. AVIS is an interactive software programme allowing our officers to virtually walk through the various types of aircraft operating at Changi Airport and in the process, enhancing their operational knowledge of the aircraft (e.g. firefighting components, escape routes, cut-in points, emergency exits).

With AVIS, AES officers at Changi now possess a realistic platform which they can access at their own time, on top of the planned training routine. To increase the effectiveness of AVIS, AES is upgrading our current version of the AVIS to include the A380. Once the upgrade is completed

in the second half of 2008, staff would be able to walk through the A380 under a virtual reality environment.

#### **Upgraded Aircraft Rescue and Firefighting Simulator**

No sophisticated IT systems can ever replace the actual 'hands-on' experience of firefighting training. In this regard, tackling a 3-dimensional aircraft fire is no easy feat and therefore requires practical ARFF hands-on training. The Aircraft Rescue and Firefighting Simulator at the AES Fireground – affectionately known as the Red Bird – was given a facelift in May 2007. The upgraded Red Bird, incorporating key features of the A380 such as an extended wingspan, wider fuselage and a higher upper deck, was officially commissioned into service in November 2007.

With this new training facility, firefighters from AES will be able to come face to face with the challenges of aircraft rescue and firefighting involving an A380. AES officers are required to participate in a 'hot-fire' drill once every three months as part of their individual training roadmap. Each 'hot-fire' drill will be designed to replicate a possible aircraft emergency scenario



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such as engine fire, undercarriage incident, cargo compartment fire. With the A380 mock-up, firefighters are required to execute the drills as per unit tactical plans to deal with an A380 emergency, with 'injects' thrown in during the course of mitigation. The 'hot-fire' drills not only serve to refresh the operational proficiencies of the officers but also test their decision-making skills.

#### **Emergency Airstairs**

AES has always strived to couple realistic training facilities with advanced ARFF capabilities. A huge step was taken to achieve this objective with the commissioning of two Emergency Airstairs in April 2006. The A380's upper deck is conservatively estimated to house about 200 passengers. With a higher passenger density on its upper deck, one of the challenges facing rescuers and passengers is to effect efficient passenger evacuation from the aircraft. The Emergency Airstairs allow AES rescuers to gain quick access to the upper passenger deck of the aircraft, ensuring the swift evacuation of passengers from the upper deck.

To improve AES' proficiency, daily station drills are conceived to incorporate the Emergency Airstairs wherever possible. The Emergency Airstairs proves to be a valuable asset in mitigating emergencies not limited to the A380, but to a whole range of other aircraft types (e.g. B777, A345, B747, A330).

#### **Ongoing Challenges**

Regardless of how effective our training is, how well-equipped, and how well prepared AES officers are for any A380 incident, overall crisis management will never be successful without the support from our mutual aid agencies under the Airport Emergency Plan (AEP) framework. AES conducts full-scale crash exercises twice a year, which involves the physical deployment of 400-500 personnel from our mutual aid agencies. These exercises facilitate the cross-pollination of ideas and help improve synergy amongst participating agencies.

With the high passenger load of the A380, it is reasonable to assume that resources from all agencies will be stretched. The Changi AEP had been updated to tighten the collaborative crisis management framework. The capacity of facilities such as the Relatives Holding Area (for Next-of-Kin), Private Matching Area (for reconciliation of survivors) and Casualty Clearance Station (for initial triaging of injured) have also been re-sized. Resources from supporting agencies are augmented to cope with the increased demands and rigours of their work.

As we understand the enormity of these possibilities, the challenge for AES is to come up with non-conventional exercise protocols to test the various cells without affecting airport operations and causing 'exercise fatigue' within the participating agencies. With this in mind, AES has plans to organise partial exercises to inject a greater sense of realism into an A380 accident scenario. This will allow us to harness all resources and channel them into various aspects of the overall crisis management framework for more in-depth testing of individual work cells.

AES will also continue to refine our unit tactical plans to take into account customised configurations of the A380 operated by different airlines, to better prepare firefighters in rescue missions.

AES will continuously devise better ways to uplift its operational readiness and stand ever ready to mitigate emergencies involving the New Larger Aeroplanes (NLA). IFF



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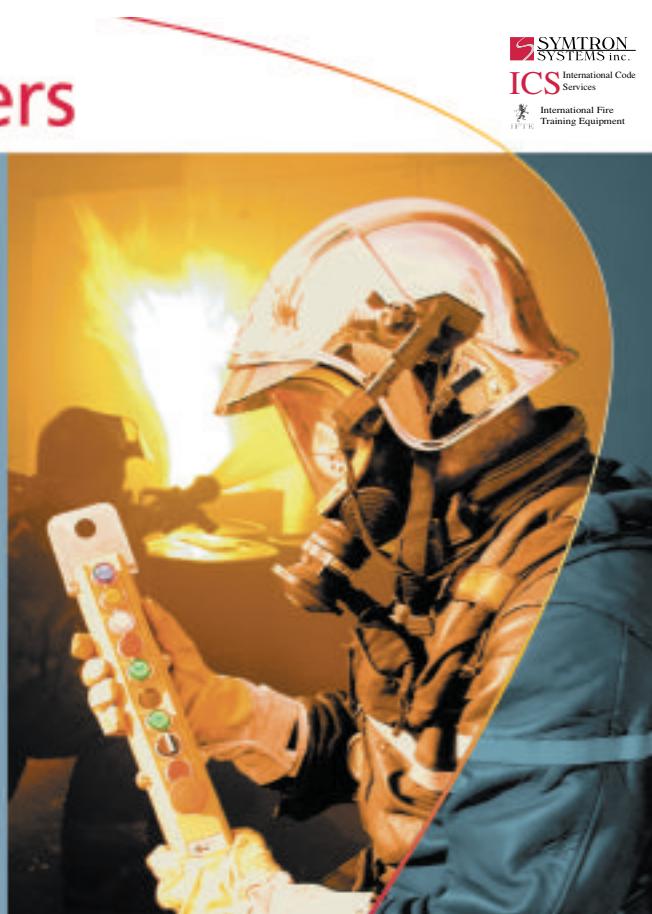
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# Ship-Shape Fire Safety

The potential for a fire at sea to develop into loss of life of titanic proportions, the destruction of a £multi-million asset and a catastrophic environmental disaster ensures that the containment and fast suppression of a fire remain uppermost in the mind of maritime safety specialists, ship owners and skippers alike. So here, Alan Elder of Tyco Fire Suppression & Building Products, looks at the latest developments in marine fire suppression technology.

**By Alan Elder**

Tyco Fire Suppression &  
Building Products

**S**uch is the impact of a major fire at sea that many owners invest far more in fire safety than they are required to do so under international regulations. Particularly in passenger-carrying vessels, the understandable horror at the prospect of having to abandon ship and take refuge in a lifeboat is a spectre that commercially-minded operators are at pains to avoid at all costs.

Once at sea, fire safety is invariably entirely dependent on the ship's design and passive fire safety measures, the fire detection and fire suppression equipment installed throughout the ship, the training of the crew, and their intimate knowledge of the particular vessel. The stark reality is that ships of all types and tonnage have to be self-sufficient because, other than when in port, even limited help is unlikely to be available and fast evacuation is equally improbable. In all likelihood, if a fire breaks out, the effectiveness of the firefighting measures are all that stand between survival and potential disaster.

There is a veritable plethora of regulations and

marine standards. However, the IMO (International Maritime Organisation) is a specialised agency of the United Nations with 167 member states, and its International Convention for the Safety of Life at Sea, or SOLAS, is generally regarded as the most important of all of the international treaties relating to the safety of merchant ships. It includes chapters on fire protection, fire detection and fire extinction, and sets down fire safety provisions for all ships, with specific measures for passenger ships, cargo ships and tankers.

These chapters contain a number of guiding principles. These include: the division of the ship into main and vertical zones, and the separation of accommodation spaces from the remainder of the ship by thermal and structural barriers and the restricted use of combustible materials. They also include: the need to detect a fire in its zone of origin; the containment and extinction of a fire in its space of origin; the protection of the means of escape or of access for firefighting purposes; and the ready availability of fire-extinguishing appliances.



In terms of firefighting measures, sprinkler systems and water mist systems are in widespread use in ships' public areas, such as restaurants, stair wells, hallways, bars, theatres and cabins. These systems are supplemented by the extensive use of portable fire extinguishers and it is not exceptional for a large passenger-carrying vessel to have upwards of 300 portable extinguishers spread throughout the ship. However, high-hazard and survival-critical areas generally continue to be protected by gaseous systems of one kind or another. These include engine rooms and machine enclosures, switchgear and communications compartments, and command and control area such as the ship's bridge.

Until its demise following the signing of the Montreal Protocol on Substances that Deplete the Ozone Layer back in the early 1990s, Halon 1301 was in widespread use protecting these areas. Unfortunately, while Halon 1301 was a first-rate extinguishant, a similar accolade could not be applied to its environmental credentials. It had ozone depletion potential, global warming potential and an atmospheric lifetime that politicians and environmentalists found wholly unacceptable.

#### **Total flooding gaseous protection**

Those not protected by Halon 1301 installations tended to rely on CO<sub>2</sub> (Carbon Dioxide) and,

although CO<sub>2</sub> is also a first-rate extinguishant, and is still widely relied upon, its use does need to be carefully controlled. CO<sub>2</sub> in fire extinguishing concentrations is lethal to people, so it is not suitable for total flooding applications in normally occupied rooms or enclosures. However, it is an ideal total flooding solution when seeking protection for unoccupied areas, with appropriate safety lock-off devices provided access – even during maintenance periods – can be adequately controlled.

Even in these cases though, it is essential to ensure that the flooded areas are adequately ventilated after discharge of the CO<sub>2</sub> to prevent the accidental exposure of personnel to dangerous levels of CO<sub>2</sub> when investigating the cause of the discharge. Nevertheless, CO<sub>2</sub> arguably remains the most commonly used gaseous suppression agent for engine compartments in merchant shipping, and in all probability, CO<sub>2</sub> has safely extinguished more fires than any other gaseous suppression agent.

Despite the effectiveness of CO<sub>2</sub> systems, in recent years, there has been a marked growing demand for a replacement for Halon 1301 that does not have CO<sub>2</sub>'s toxicological limitations, and currently the IMO's Maritime Safety Committee is reported to be looking into the fitting of inert gas systems to prevent explosions in chemical tankers and oil tankers. However, while in INERGEN®, Tyco has a world-leading inert gas system, the company's SAPPHIRE® fire suppression system offers ship owners a number of additional benefits. So much so that, since its introduction in 2004, the system has been installed in more than 1,000 ships and recently won the prestigious Seatrade Awards 2007 Safety at Sea Award, sponsored by Lloyd's Register. It has all of the major approvals and is wheelmark certified to the Marine Equipment Directive.

SAPPHIRE utilises 3M™ Novec™ 1230 stored in containers as a low vapour pressure fluid that, when discharged, transmutes into a colourless and odourless gas. Typical total flooding designs for marine applications use a 5.5 percent concentration by volume of the fluid, well below the agent's saturation or condensation level. When discharged, the agent is dispersed through natural ventilation. While certain inert gases are used at design concentrations that are below the NOAEL (No Observed Adverse Effect Level) with safety margins from seven percent, no other gaseous Halon alternative comes anywhere close to the SAPPHIRE system's safety margin.

This is an important consideration because the volume of the space on a ship is often difficult to calculate accurately – due to the complexity of the machinery – the installation's designer will often err on the side of caution and include more agent than the volume requires. Additionally, the calculation is based on the minimum anticipated temperature in the protected space, whereas the reality is that the temperature will be higher, which will lead to a further "over concentration". This combination of factors has the potential for more agent to be provided than the volume truly requires. This will usually take the achieved concentration closer to, or above, other agent's NOAEL level, whereas the huge margin between the SAPPHIRE system's NOAEL level and design concentration provides a high degree of personal safety.



### First-response protection

It is a widely accepted truism that prompt action often has a significant impact on the final outcome of what may start as a small fire. This applies to all fires, but is particularly the case with shipboard fires where the only available means of tackling a blaze are the systems the ship possesses. Fast-response first aid firefighting in the form of portable extinguishers is, therefore, of paramount importance.

These portables obviously need to be "wheelmark" certified to EU Marine Equipment Directive MED 96/98/EG to verify that the equipment is fully compliant with the relevant international marine regulations. Equally important, they need to be manufactured to the highest international standards and offer the robustness and corrosion resistance that exposure to the harsh, salt-laden environment demands.

For these reasons, the premium-build specification TOTAL® portables, for example, are manufactured in a purpose-built factory in Germany to the industry's most exacting standards. The range comprises foam portables for Class A and Class B fires, CO<sub>2</sub> extinguishers for Class C fires, and powder portables for Class A, Class B and Class C fires. Every cylinder is electrode-tested to ensure that there are no pin-point flaws in the coating.

Further information is available from **Tyco Fire Suppression & Building Products** by telephone on +44 (0) 1493 417600, by fax on +44 (0) 1493 417700, or via email at [tspmarketing.emea@tycoint.com](mailto:tspmarketing.emea@tycoint.com)

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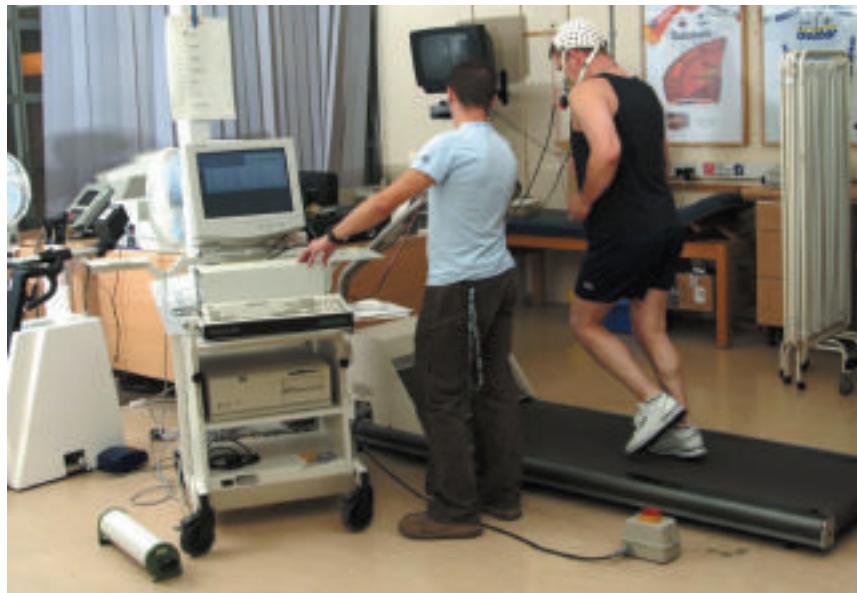


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# Research & Development drives PPE innovation

## How it all started

The United Kingdom is widely recognised globally as having some of the world's best manufacturers of firefighter PPE. And not without good reason. In the early 1980's it was literally a case of "necessity being the mother of invention" when one major fire disaster in London's underground network, which tragically saw the deaths of 31 people including one firefighter, with others injured, brought home the lack of protection provided by the tunics then worn routinely by our municipal firefighters.

**By Paul Gibson**

Regional Export Sales  
Manager, Bristol  
Uniforms

The King's Cross tube station fire 1987 highlighted the inadequacy of woollen tunics and pvc "wetlegs" trousers as they failed to provide adequate protection against the fierce underground heat and flames which characterised this incident. In 1988 the A26 Home Office specification ushered in the first designs and combinations which are the basis of today's firefighter PPE ensembles. Bristol Uniforms was actively involved in developing both the earlier A19 and then the A26 Home Office specifications and began what was to become a long involvement in the development of new garments, fabric combinations and today's national and international standards which have their origins in these early specifications.

### **The virtuous circle**

New product development and the research that lies behind, or precedes it, is part of the virtuous circle of innovation built around the needs of the customer. Whilst necessity was undoubtedly the mother of invention back in the 1980's much of the progress which has been made over the past 20 years or more has resulted from the close working relationships between the PPE manufacturer and the customer, on the one hand, and the PPE manufacturer and the fibre and fabric manufacturers on the other.

Careful monitoring of the performance of firefighter garments has helped to identify desirable performance improvements in terms of flame and



water protection, moisture vapour permeability and wearability as well as the need to constantly look at ways of improving the compatibility of various elements of PPE when worn in combination.

### The role of fibre and fabric manufacturers

A robust and efficient supply chain committed to meeting the needs of the specialist PPE market is essential for the smooth working and international competitiveness of the UK's firefighter PPE manufacturing sector which has worked closely with both the fibre producers and fabric weavers for many years. This close cooperation has led to an unrivalled understanding and appreciation of each other's needs within a supply chain which is also recognised as one of the most highly developed anywhere in the world today.

The chain begins with the world's leading fibre producers which are, in the case of firefighter PPE, Dupont, PBI Performance Products Incorporated and Kermel. These companies in turn supply directly, or indirectly through yarn spinners, the leading fabric weavers including A W Hainsworth & Sons Ltd and Heathcoat Fabrics Ltd in the UK.

The origins of this supply chain collaboration lie in the pioneering work undertaken by Bristol Uniforms as early as the 1960s and further developed in the mid 1970s when discussions between Bristol and Dupont led to the introduction of the first Nomex outer shell product in 1980. Named Nomex III, it was introduced by Bristol Uniforms to the fire market and was made from a 265gsm blend of 95% Nomex fibre and 5% Kevlar. This was followed by Nomex Delta T, a 195gsm blend of 75% Nomex fibre, 23% Kevlar and 2% antistatic, in 1990. During the 1990s Delta T steadily superceded Nomex 3 and became one of the leading outer shell fabrics throughout Europe.

In 2000 Hainsworths introduced their current class leading fabric, Nomex with Ti-Technology. This is an entirely new construction with a weight of 220gsm and uses a dual layer advanced woven fabric system with a 95% Nomex and 5% Kevlar outerlayer interlocked with a 100% Kevlar grid on the inner side. Differential shrinkage of the two layers is accommodated by the bonding process of the layers using a Nomex fibre yarn providing improved wearer protection against heat from flash fires. Bristol was the first firefighter PPE manufacturer to introduce these fabrics into their garments.

In the mid 1990s Heathcoats entered the market

to supply outer shell fabrics for firefighter garments. By using PBI fibres from PBI Performance Products Incorporated which accept dyes, the company has been active in the development of colour variations to PBI Gold, the natural colour. In recent years both navy and red have been made available for new PPE introduced by Bristol.

The characteristics of today's major fibres used in fabric combinations have been available for some years. This has allowed the fabric weavers the scope to apply their technological and design skills to the development of new constructions which have become available to the manufacturer for firefighter PPE applications. Over time, the improved understanding of fibre performance has made possible the development of different weave ratios to give improved performance.

WL Gore & Associates are a leading membrane manufacturer supplying the intermediate layer which provides the thermal and moisture barrier within the garment construction. Products such as GORE-TEX® Laminate with AIRLOCK® Spacer Technology, GORE-TEX® Fireblocker Laminate and Crosstech® Laminates form a range of membranes developed specially for fire garment use and provide high performance protection. Gore use a blended aramid substrate to provide strength in their non-woven constructions.

Finally each garment has an inner lining. A number of companies, mainly French and German, manufacture firefighter garment linings. Using principally aramid fibres, the linings are normally supplied through specialist quilters before arriving at the garment manufacturer.

### The garment manufacturer's role - bringing it all together

The contribution of the garment manufacturer in the performance and comfort of the final product is a combination of a number of things including:

- Selection of the best individual layers which in combination deliver the right technical and comfort characteristics
- The knowledge and skills required to design the combinations so that they can be brought together without compromising the performance of any individual component
- Accuracy of measurement in fabric cutting combined with skilled machining to produce durable and well-finished garments
- Attention to detail in garment sizing to ensure good fit and wearer comfort for both male and female users
- Careful selection of trim and finishes to achieve the specified in-service performance of the user
- Manufacturing methods which result in garments which are not only durable but have the required longevity to undergo regular maintenance under a managed care programme which involves frequent washing and drying as well as periodic decontamination, depending on service exposure experience.

All firefighter PPE is required to meet one or more national, European or international standards. The most widely specified throughout Europe and many other parts of the world is EN 469:2005 and garment design must ensure that in combination the layers of fabric perform under test to meet or exceed the required levels of protection against flame, heat, water penetration and breathability.

Firefighter garments include not only fire coats and trousers but also gloves, boots, flash-hoods, helmets and underwear. These all need to work effectively in combination and the fire coat and trouser manufacturer has a responsibility to ensure compatibility between these and the other PPE to afford flexibility of choice for users between a

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number of options available to them. Bristol Uniforms has a special department whose role is not only to undertake individual wearer sizing but to run garment compatibility tests with whatever other PPE the fire service personnel are supplied with.

#### **Wearer trials - compiling empirical evidence**

Firefighter garments are deemed fit for purpose provided they fulfil requirements in the two key areas of technical performance (protection) and wearability (user comfort).

Technical performance is achieved through the skill and knowledge of the product designer supported by independent physical tests which allow product certification to specified standards. Organisations like the British Textile Technology Group (BTTG) are certified independent test houses to which manufacturers will submit garments for test against a series of physical strength and behavioural test criteria and to achieve certification to the appropriate standard.

Garment performance in fire situations is measured using computer monitored manikins in which fire garments are fitted to glass epoxy body models fitted with heat sensors. These sensors are linked to a computer with a special programme which measures and records the surface temperature at many points around the body to ensure that the tested garment meets the level of heat and flame protection required.

Whilst machines and computers can provide accurate testing of physical properties, physiological response and wearer comfort still require the involvement of human beings.

In 2003 Bristol Uniforms, as part of its ongoing research and development, set up and undertook a series of wearer trials at Birmingham University over the space of a week during which a team of volunteers from the ranks of regular firefighters from the Midlands took part. These trials focused not on the protective qualities of the garments but their physiological impact on the wearer. Specifically the core tests were designed to measure levels of heat stress under prolonged wear of different fabric combinations as part of Bristol's programme to introduce new designs which would be lighter and more flexible. Independently conducted by Human Vertex Ltd, the trials included extended treadmill exercises during which a computer programme was used to convert body sensor information on breathing and heart rates, body core temperature and sweat rates.

The trials also included ergonomic tests on the firefighters whilst climbing, crawling and wearing breathing apparatus. These were used to assess the impact of activities frequently experienced by firefighters in everyday real life situations and also included donning and doffing of the kit. These blind tests by the wearers were used to indicate levels of wearer comfort on the different garments.

#### **Investment in new product development**

The investment in research provided a combination of scientific and objective results which were used extensively in refining product design and development. They made a substantial contribution to, and were a major component in supporting, the Ergotech™ and Ergotech Action™ design programmes which saw the introduction of the first lightweight garment contructions which have been progressively adopted by fire & rescue services across the UK and increasingly in other EU countries.

Since then the work undertaken during that test programme has been used in other product development programmes including those for new urban search and rescue (USAR) and wildland firefighting PPE.

#### **Firebuy's Integrated Clothing Project**

The value of manufacturer led research and development, coupled to close collaborative working with key players in the supply chain, can be seen in the results achieved following the introduction of improved garment design as well as the levels of adoption of UK manufactured PPE throughout Europe and other parts of the world.

In the UK Government's Integrated Clothing Project tendering process, begun in 2003, tenderers were required to demonstrate the performance of their product offerings in a wide range of tests covering design and aesthetics to physical performance and durability. Amongst these tests were wearer physiological response trials which for Bristol, having already undertaken similar work previously, helped to further underline the value of independent research in successful new product development programmes.

#### **Remaining competitive in world markets**

A robust and demanding home market is undoubtedly one of the keys to the UK's success in world markets. Another is the central role that the UK has played from the earliest beginnings in shaping performance standards – first with the UK government's Home Office in the 1970's, then through the work of the BSI standards committees and then, in turn, the BSI's influence on European standards bodies – an influence which is still felt strongly today.

However, as any global player will attest to, success internationally depends on more than the ability to meet required standards. A global presence in the PPE market will always be a major driver of an individual company's R&D strategy. This transcends any government involvement in regulating or influencing public sector behaviour in individual countries and any purchasing policies which result will have only a limited impact on companies' R&D programmes. Products will continue to be designed to satisfy international standards and meet the needs of global markets to remain competitive. Bristol will continue to invest in new product designs working collaboratively with fibre and fabric manufacturers to produce world class products and help to maintain the UK's leading international position in the manufacture and supply of firefighter PPE.

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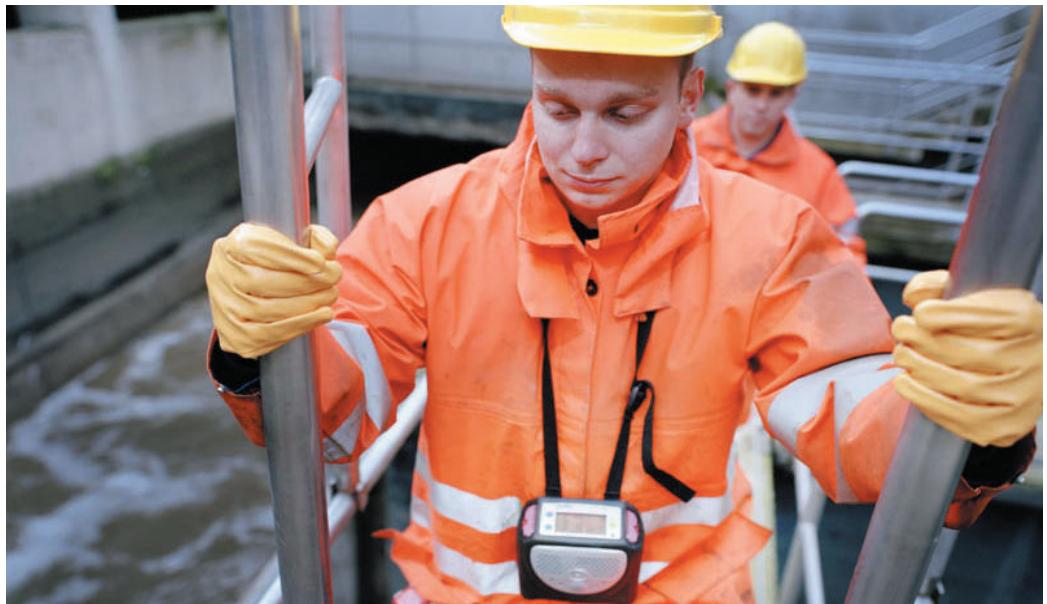
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# Keeping Safe With Gas Detection Equipment

Even if firefighters were to wear breathing apparatus on every single shout, there would still be a need for gas detection. Gases, particularly those often found in chemical or industrial plants, can have a far reaching effect, from poisoning nearby personnel to causing widespread environmental pollution. Depending on the hazards involved, a spark or other source of ignition could also have explosive consequences, and entry into a potentially lethal atmosphere by unprotected personnel could prove to be lethal.

**By Ian White**

Product Specialist,  
Draeger Ltd

Unlike smoke and flames which are relatively easy to see, toxic and flammable gases are usually invisible to the naked eye. They can also be complex in their configuration and may be the result of more than one process resulting in combination gases and a different kind of danger. For this reason, firefighters need to assess what it is they are dealing with, as quickly as possible. Once armed with the facts, they can respond to the numerous challenges that arise both quickly and competently.

## Defining the Problem

Firefighters have a need for rapid and accurate information about the nature of an incident. The use of the right gas detection system can quickly determine the type and level of the substances involved, thereby helping to eliminate the risks and increasing awareness of the dangers they are likely to face.

Whilst the nature of the incident can sometimes point to the type of hazard that might be found, nothing can replace the certainty that comes with

reliable, accurate air monitoring.

For instance, an earthquake or other natural disaster might immediately point to town gas and methane but it could also cause exposure to hydrogen sulphide, sulphur dioxide, carbon monoxide. It could also mean a lack of oxygen altogether! In the same way, a terrorist incident might feature nuclear, biological or chemical hazards, whilst an industrial accident might involve a number of combination hazards.

In the brewing industry, for example, increased levels of nitrogen are used to make a more effervescent beer and, as a result, there is a risk of oxygen depletion which, in turn, could lead to asphyxiation. In hospitals, laboratories and universities, liquid nitrogen is used as a freezing agent. Colourless, inert and odourless, this substance can, in enclosed areas and confined spaces, cause severe oxygen deprivation.

Steelworks bring a different set of potential hazards with a potentially volatile mix of oxygen and carbon monoxide creating serious blast levels. Responding to an incident at a food processing

plant could involve high levels of disinfectants or high levels of ammonia in refrigeration and cold storage areas. Even in the relatively "safe" semiconductor industry, the use of ammonia, arsine and bromine can bring its own toxicity problems.

To compound the problem, it is also possible that toxic and/or flammable gases and vapours

that were created during a previous application may still be present, or that hazardous bi-products may be created by the fire itself from otherwise non-hazardous materials.

Whilst not exhaustive, the following lists some of the most common substances that may be encountered:

SOURCE	SUBSTANCE
Combustion processes such as open fire, tobacco smoke. Vehicle exhaust gas	CO <sub>2</sub> , CO, Nox
Cleaning agents, disinfectants, furniture polish, stain removers, shoe polish spray, nail polish remover, correction liquids, pickling agents	Toluene and aromatics, hexane and aliphatic hydrocarbons, formaldehyde, other aldehydes
Glues and Paints	Toluene and aromatics, hexane and aliphatic hydrocarbons, formaldehyde, other aldehydes
Insulating material, foams, damping material, chipboards	Styrene, formaldehyde
Gasoline/petrol stations	Toluene, benzene and other aromatics, hexane and other aliphatic hydrocarbons
Refrigerants, anti-oxidant in metal furnaces	Ammonia
Food processing, magnesium foundries	Sulphur dioxide
Semi-conductor manufacture and rework	Ammonia, bromine, hydrogen chloride, hydrogen cyanide
Paper and man-made fibres	Chlorine
Decomposing and biological matter	Methane, H <sub>2</sub> S, oxygen deficiency
Dry cleaning and degreasing	Tetrachloroethylene



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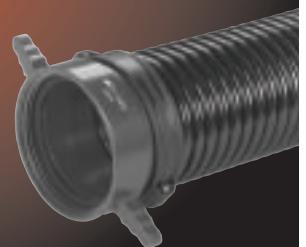
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The effects of these substances are varied and are obviously dependent upon the levels of concentration involved. In broad terms, the substances can be categorised as either simple or chemical asphyxiants, irritants or narcotics:

Simple asphyxiants such as carbon dioxide ( $\text{CO}_2$ ) are not usually life-threatening but their presence can displace oxygen in the air to such an extent that the lack of oxygen can, in itself, be dangerous. Whilst low levels of  $\text{CO}_2$  might cause breathlessness but high concentrations can lead to a loss of consciousness within just 60 seconds.

Chemical asphyxiants such as carbon monoxide (CO) and hydrogen sulphide ( $\text{H}_2\text{S}$ ) can be immediately dangerous to life and health in that they interfere with the transportation of oxygen within the body. Symptoms might include giddiness and headaches before eventual collapse, and exposure to a high concentration of  $\text{H}_2\text{S}$  can paralyse the respiratory system immediately.

Exposure to Irritants such as ammonia, chlorine and sulphur dioxide can cause ulceration to the throat, watering eyes, sneezing and coughing. Where escape is difficult and exposure is prolonged, breathing can become so severely restricted that it could prove to be fatal.

Hallucinations can follow exposure to high concentrations of Narcotics such as toluene and tetrachloroethylene.

#### **Looking at Portable Solutions**

Regardless of whether there are single or multiple gas hazards involved, there is more to the selection of gas monitors than hazard detection. The type of incident, as well as the method of working, must also be carefully considered. For example, if two hands are required to carry out a task, can the portable detector be worn around the neck? If gloves are worn and a handheld system is being used, can the instrument still be operated easily and efficiently? Is data logging required? Can the display be seen in poor light? Will it work in hot and humid atmospheres? Is it intrinsically safe? Other questions that spring to mind might include:

#### **Which alarms are available?**

The better units combine vibrational with visual and two-tone audible alarms which are activated as soon as the threshold levels are reached. This is particularly important for firefighters who may be working in poor light and very noisy environments.

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What about the reaction time of the sensors and how often is maintenance required?

The latest electrochemical sensors respond immediately to any gas hazard and can offer maintenance free operation for up to five years.

Will the unit still work reliably if it is accidentally placed in a jacket pocket?

Units such as the Draeger X-am 2000 have gas inlets on both the top and front to ensure that, even if this were the case, it will still provide reliable warning against gas hazards.

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**TÜV**



Is performance affected by the small size of a unit?

Some units can be as small as a mobile phone. By using the latest, miniaturised sensors such as the XXS generation from Draeger, gas detectors can retain their powerful functionality and still incorporate two-button control panels, a large liquid crystal display and easy menu guidance.

What should be used where explosive hazards might be involved?

For improved safety when facing unknown hazards, some units incorporate a catalytic Ex sensor which, when calibrated to methane and other substances, responds quickly to explosive gases and immediately warns the user.

Portable systems that are suitable for use by firefighters include short term tubes as well as personal single and multi-gas monitors.

#### Tubes

Providing on the spot measurement, short term tubes are suitable for monitoring personal exposure, spot check measurements, leak checks and confined space investigation. The Draeger-Tube range, for instance, enables fast, accurate measurement of over 500 different types of gases and vapours and can be used with hand bellow pumps which enable rapid measurements to be taken with optimum volume and flow specifications.

Spot measurements can also be easily carried out with the Draeger Chip Measurement System (CMS), a portable, multi-gas detection system that requires minimal user training and which provides an immediate true digital readout.

#### Personal Single Gas Monitors

Simple to use, these instruments can be handheld or clipped to the user via a crocodile clip. Often available with an additional neckstrap, they can monitor a broad range of gases and provide an immediate, clear visual display of gas concentrations. They can also provide audible, vibrational and visual alarms when danger levels are reached. By way of example, the fast response, pocket-sized Draeger Pac 7000 is tailor-made for constant use and incorporates the new, longer life Draeger XXS

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The SP700 is ideally suited to operation in remote areas, and for RIT, forcible entry, or anywhere combustion exhaust poses a hazard. Its quiet operation allows for a more controlled rescue scene.

The VP700 backpack power unit is identical in weight and function to the SP700. The sturdy outer case allows for operations in the most unforgiving environments, making it perfectly suited to confined space, and other high hazard areas. The straps provided are robust enough to allow the unit to be lowered by helicopter into an emergency scene.



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sensors. Offering a high level of reliability and fast warning against harmful concentrations of a wide variety of gases such as carbon monoxide, hydrogen sulphide or oxygen, it can also transmit data via an IR interface.

### **Multi-Gas Monitors**

High performance, modern units such as the Draeger X-am 7000 can provide continuous detection of up to five gases simultaneously, and feature individually adjustable visual and acoustic alarms. A choice of over 25 sensors is offered with this particular unit and, because each sensor is pre-calibrated and is recognised automatically by the instrument, this innovative instrument can be reconfigured simply by changing a sensor, without requiring additional service or maintenance. In addition, the measuring range of these sensors can be changed to any other gas detected by that sensor, by the push of a button and without needing recalibration. This means that the accuracy and range of the monitored substance is substantially increased.

Other instruments are available for use where combination hazards involving explosive gases and a lack or surplus of oxygen may exist. As small as a mobile phone, for instance, the Draeger X-am 2000 is one of a new generation of gas detectors which have been specially designed for personal monitoring use. Offering reliable measurement of combustible gases and vapours as well as oxygen, carbon monoxide and hydrogen sulphide, this 1 to 4 gas detector is the perfect companion in any gas sensitive area. For improved safety when facing unknown hazards, the catalytic Ex sensor, calibrated to methane, responds quickly to explosive gases. Offering a high level of sensitivity to combustible organic vapours it also ensures dependable warnings in the event of explosive hazards.

Ergonomically designed and easy to use, this lightweight unit features the latest miniaturised XXS generation of powerful electrochemical DraegerSensors. With a practical two-button control panel and straightforward menu guidance system, it benefits from a large liquid crystal display which provides all readings at a glance. Fitted with a crocodile clip for secure attachment to clothing, it incorporates gas inlets on both the top and front to ensure that, even if it is accidentally placed in a jacket pocket, it will still provide a reliable warning against gas hazards.

For many firefighters, the issue of domestic preparedness and the threats associated with chemical and biological agents have been brought to the fore in recent times. Providing continuous measurement in real-time, the Draeger Multi-IMS, for instance, is easy to use and will quickly detect a wide range of chemical warfare agents.

Incorporating a sensor based on Open Loop Ion Mobility Spectrometry, it utilises an ION Mobility Cell to provide improved sensitivity and selectivity. Concentration, trend and relative dosage measurements are easily taken and a range of graphical alarms indicates both the substance and concentration level as well as the hazard type, i.e. nerve, blister or blood/choking agent. Bar graph displays clearly show the current concentration levels as well as alarm volume and battery status. With a built-in pump and RS232 datalogging interface, it also features audible and visual alarms and an automatic self-check.

Photo ionisation detectors (PID) are perfect for tracing volatile organic substances in air. Able to detect whole groups of substances, these multi-functional, robust instruments can also be calibrated to monitor individual hazards. Especially useful in confined space measurements and emissions monitoring, they can also assist in fire investigation and in post-accident screening.

### **Fixed Gas Detection Systems**

Many industrial processing plants and utilities organisations are given round the clock protection with fixed gas detection systems. Designed to constantly monitor and detect explosive or toxic gases and vapours as well as oxygen deficiency and/or enrichment, these sophisticated systems can be used to sound alarms and initiate evacuation, or to switch off entire processes in the event of a problem.

Used to monitor specific areas as well as remote and/or multiple sites, their data can also be recorded which means that they can provide valuable incident information before firefighters arrive at the scene.

Incorporating HART technology, Draeger REGARD Controllers, for instance, are often used in conjunction with Polytron infra-red, explosion proof and open path transmitters in applications where fail-safe protection is required. Designed for use under the toughest conditions, they are also protected against RFI, high vibration, shock and corrosion and can provide accurate information that firefighters can both rely and act upon.

The Draeger Safety division offers products, services and system solutions for all encompassing Risk Management such as personal and facility protection. Customised system solutions include workshops, training and breathing gas management systems, diving, rescue and high temperature training systems, and tunnel rescue trains.

**IFF**



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## TRAINING



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*The picture shows a massive cloud of anhydrous ammonia, at a intersection of 2 major interstate highways as a result of a tank truck accident. The electronic sign shows the time and temperature at the time of the incident. If this happened 3-4 hours earlier, or 6 hours later, the roadways would be solid with stop and go traffic causing the death of perhaps 100 or more people.*



# Training For The Unexpected

Industrial complexes train just as we do in Municipal and volunteer fire departments. However, most of the training we do is based on routine everyday expectances. In doing so, we discuss and explain and train for the unexpected with the idea being we will be able to respond and react correctly when the UNEXPECTED arises.

By **Dave Cochran**

In reality, most events considered out of the ordinary rarely occur; however, many industrial fire chiefs, or as often the case today, emergency response coordinators (for some reason some organizations) have eliminated the title of fire chief, DO Experience the out of ordinary event. The advantage here, is that person has trained their people extremely well, has the confidence in their leadership, and in most cases the event is handled successfully. IF I told you luck did not play a part in some of these events, I would be lying. If I told you the help of operators in the industrial complexes, did not play a part, or have a role in these events, I would also be telling you something wrong.

In 1989 for example, in December, and just before Christmas, there was an extremely long cold spell. This brought temperatures down to below freezing for several days. Homes in the south are not built like the homes in the northern portions of the United States. The result was water pipes froze causing millions of dollars in damage to residential and business buildings. In a major oil refinery in Louisiana, piping froze, and

eventually some ruptured allowing fuel to escape to atmosphere and ignite. To say a major fire occurred as a result would be an understatement. Operating units, several storage tanks, piping, etc. were all involved with fire creating a major disaster, causing windows to be broken in the city-including the capitol building.

This situation was handled successfully over a period of time, and involved not only the refinery fire brigade, but the entire mutual aid members, and a very successful contract fire fighting team. I am personally aware of the training involved with MANY of the refinery teams, the then fire chief, and the contract team. They trained constantly and still do, costing the company a lot of money to maintain the excellence necessary for not only the routine every day emergency situations, but those considered to be the (hopefully) once in a lifetime event.

Many companies maintain a fire department staffed by full time firefighters who not only combat the emergency situations, but train the members of the fire department, fire brigades, and operating personnel in matters dealing with



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**Many companies maintain a fire department staffed by full time firefighters who not only combat the emergency situations, but train the members of the fire department, fire brigades, and operating personnel in matters dealing with first aid, H<sub>2</sub>S, firefighting and other emergency related subjects.**

first aid, H<sub>2</sub>S, firefighting and other emergency related subjects. Others simply have a fire brigade, some who train constantly, and others who train periodically. The expertise of those who train periodically is probably less than a top rated group, and oftentimes the size of the facility will dictate how much and how well trained and efficient the people are prepared to handle those emergency events when they occur.

In my case, when I served in a refinery fire department, we were, for the most part, all volunteer firefighters, with some training in the industrial sector. This was because we were expected to be called into the refinery when the event became beyond what could be handled by the fire brigade. The problem was, the fire brigade, for the most part, had no desire to be involved in the combat of fires. Because the chief of the department would not admit we needed to involve outside firefighters almost on a routine basis, we barely got by. This was because we never had many major events. AND a big part of this was because the fire department members-which consisted of just seven (7) people. Four (4) of these were on a rotating shift. This eventually was expended.

As a young volunteer, one of the first major

fires I attended was in a small chemical complex. We were in the first response mutual aid group, and laid a line into what was already a long line of spaghetti which was necessary to supply sufficient water to handle the situation. My Chief, took me and a couple of others into the upstairs portion of the building. From here, we were looking down on many many-probably a hundred or more 300 cubic foot bottles of whatever chemical. These were blowing up, skidding across the floor, spinning, hitting other objects, etc. and let me tell you, if you have never seen this happen, you don't want to. WE didn't waste much time before we began cooling these in order to prevent someone getting hurt or worse killed. We found out later, when the first apparatus rolled in, a firefighter, when he got off the back step (tailboard), was struck by a flying piece of metal and was decapitated. Strangely enough, he and I worked together as pipe coverers, and had worked together that day.

I suppose the good thing was the experience I gained, I was not afraid, and my career has prospered as a result of my early training. That Fire Chief, by the way is now deceased, his name was Howard "Hattie" Drennen, and I had the honor of being one of the honor guard at his funeral.

**In Industrial complexes, valve closures and openings must be at the control of the operating group-firefighting personnel may make the closures, but the operating group MUST determine what valve(s) if any, are to be operated. To haphazardly open or close valves will create more complex and dangerous situations.**



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As fire chief in a refinery, I worked with the volunteers, was one of them, and not only trained them in the refinery, but I also worked as a Field Instructor for the Delaware State Fire School. In this capacity I trained many in both flammable liquid and gas courses. I knew most of them by their first name and had their trust- and I in turn trusted them. I convinced management to allow me to use the volunteers as my main line of defense for not only major, but anything that required more than the four (4) or five (5) fire brigade members available at any given time. This meant setting up a box alarm system to better align the call out through the County Fire Board system.

NOW, here becomes the problem. In Industrial complexes, valve closures and openings must be at the control of the operating group—firefighting personnel may make the closures, but the oper-



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*The unexpected can and will happen.*

On February 29, 1972, at 9:20 PM, I received a call from the plant of a fire at the Coker unit. I lived 10 miles from the refinery, and when I turned onto the highway, a block from my house, I saw the fire. The fire Inspector on duty had already initiated the call to activate the mutual aid call out. I passed my volunteer fire department's first piece not long after it left the station. There was no doubt this was a major fire situation, and we needed help.



ating group MUST determine what valve(s) if any, are to be operated. To haphazardly open or close valves will create more complex and dangerous situations. In all outside assistance situations one of the first things told to the officers in charge of all responding fire departments was "DON'T TOUCH ANY VALVES OR OTHER PIECE OF EQUIPMENT UNLESS TOLD TO DO SO AND THEN UNDER THE DIRECTION OF THE REFINERY FIRE PROTECTION GROUP". If at all possible, valves should be closed at remote locations as opposed to moving a team of firefighters in with protective hose lines to close a valve(s). Often times, however, and because of the time delay caused by closing valves remotely, decisions are made to eliminate the fire more quickly to prevent further damage to equipment and also more danger to those responsible for combating the situation, valves are closed near if not at the area creating the problem. That has worked well and outside assistance has been used on most if not all emergency situations in this facility.

On February 29, 1972, at 9:20 PM, I received a call from the plant of a fire at the Coker unit. I lived 10 miles from the refinery, and when I turned onto the highway, a block from my house, I saw the fire. The fire Inspector on duty had already initiated the call to activate the mutual aid call out. I passed my volunteer fire department's first piece not long after it left the station. There was no doubt this was a major fire situation, and we needed help. There was also no doubt this was not a routine fire. In 55 minutes, essentially an entire refinery unit was burned to the degree a total rebuild of the structure itself-not the vessels, but piping and deck structure of the unit which was approximately 300 feet high was damaged beyond routine repairs. The total damage was 16 million dollars

which for years was the highest loss in the petroleum industry. There have been many more since then of larger loss in dollars AND loss to personnel. On that incident there was but one injury, a broken nose that occurred when a 3 inch coupling on a length of fire hose broke into three equal pieces. To this day I believe it was a faulty coupling.

After the fire burned itself out, and after a delay in time, the fire flared up again for another 20 minutes, then burned itself out once again. The cause of this was when a valve was opened by mistake. Again there was no injury or additional loss of property. There were approximately 200 volunteer firefighters involved in combating this fire, and the expertise and cooperation was outstanding. I take this opportunity to again thank each and every one of them. Let me give all readers a piece of advice, and this can be used

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on any vertical structure. When involved in combating vessels that are vertical in nature, get some object-transients preferred- from two (2) angles to assure the vertical integrity of that vessel or vessels is not violated. As in the case of the Coker structure, the deck structure from about the 17th to 19th decks (the 19th was the highest) had separated and moved out approximately 5 feet from the vessel which at this point was called the Scrubber. It was determined there was no danger of it falling, but we moved all firefighters and apparatus away from the north side of the unit. We did this one apparatus at a time to eliminate the number of firefighters being in the vicinity during this process. While the dollar loss was significant, this was considered a successful event. No one was hurt and the light ends area of the unit was not touched. The volunteers earned high praise for their efforts, and received monetary donations-albeit small compared for the job they did, but proved my point-we needed them. By the way, the cause of the fire was the wrong metallurgy was used in an elbow located on the second deck of the unit and was where the steps met the structure. In addition, several operators were in a shanty about 20 feet to the east of the pipe in question. When the fire started, the ignition blew the door open, exposing the fire to the men. They escaped through a permanent ladder out the rear of the shanty that had been installed just a few weeks prior to the fire. Talk about luck-or divine intervention-you figure it out. The oil was 660 degrees in temperature and auto-ignited when released to atmosphere. This was not known for several days not in those days, the largest fire fighting nozzle available was 500 GPM, which would have no effect on reaching the upper structures. Today, with the "big guns" and the capacity and reach capabilities they obtain, combating high structures is much easier, thus the ability to cool and protect the upper reaches of such structures. In addition there were several operators located in a protected shanty located

about 20 feet from the elbow in question, and an escape ladder had just been installed just a short time before the fire, which allowed the operators to escape unharmed other than being highly scared and relieved

They were unharmed. Was it luck or divine intervention? I have my thoughts!

In another event several years after my transfer and promotion to another division another event took place that was not fire related-but could have been. It involved escaping gas which knocked over several members of the response group-including the fire chief. A former and retired member of the fire department and volunteer was there and assumed control of the fire department until order was restored. The name of the game is training.

Many facilities have docks that handle both barge and ship traffic. This requires the training of personnel in marine firefighting. Unless the facility has the necessary props to allow for this type of training, you either have to simulate shipboard or engine room props to give some idea of how to safely combat these situations. There are only two (2) training facilities with these type props-Texas A&M, and RISC in Rotterdam, Holland. There may be others, but they are the ones with which I am familiar. Both of these training facilities have the ability to give hands on and very realistic situations. Some facilities – one I recall would not permit the fire brigade personnel to do anything but combat such a fire from anywhere but the shore or dock. No one could board the vessel to combat a fire or emergency situation. I suppose the logic was to cut the vessel loose and let it handle the situation alone – which years ago I am told was the norm. I can't imagine cutting a vessel loose in the Houston Ship Canal, the Nueces River in Corpus Christi, or the Delaware River and other such waterways.

It is highly recommended all facilities train for any and all types of emergency situations. If they don't have the training facilities, then they

**Many facilities have docks that handle both barge and ship traffic. This requires the training of personnel in marine firefighting. Unless the facility has the necessary props to allow for this type of training, you either have to simulate shipboard or engine room props to give some idea of how to safely combat these situations. There are only two (2) training facilities with these type props-Texas A&M, and RISC in Rotterdam, Holland.**

**Another scenario I happened to become involved with occurred in a large eastern city, involved two partially overturned propane rail cars. There was some leakage, but, fortunately not serious ones. Water was provided for dissipation of the vapor cloud, which was correct to do. The rail road, because of the heavy rail traffic, wanted to get the tracks open as soon as possible and to repair the rail bed on the track involved.**

should send the brigade personnel to a facility – wherever it may be to train. Always train for the unexpected, and if you train outside agencies, train them just as you would your own people – especially if they have an opportunity to assist you when the need arises. If you have been in the business for a long time, you know it will happen-you just don't know when.

Another scenario I happened to become involved with occurred in a large eastern city, involved two partially overturned propane rail cars. There was some leakage, but, fortunately not serious ones. Water was provided for dissipation of the vapor cloud, which was correct to do. The rail road, because of the heavy rail traffic, wanted to get the tracks open as soon as possible and to repair the rail bed on the track involved. They were going to use open flame boilers, which is not really conducive with flammable vapors in evidence. In order to eliminate the situation as quickly and safely, we had two (2) highway propane trucks placed on two flat bed rail cars, and placed at the end of the train. In this manner the rail cars were piped to the two trucks, emptied safely, the train was moved out, the two propane cars were up-righted and then re-tracked and the incident was over. The unexpected had occurred, was thought through by using experts from the rail industry, the propane

industry, and fire department, all of which brought a potentially dangerous situation to a close-safely.

The name of the game is TRAINING, and even though it may be difficult to do so, training in the complex operating areas is a must. If possible flow water of the volumes necessary to combat your high rise structures, and other vessels and piping to better familiarize you responding fire brigades with what is expected. This should include those outside organizations as well. If you haven't done so you should. Sewer systems, over years of service may not flow the necessary amounts it was originally designed to handle. Drills such as just mentioned will show the results, and, hopefully, prove to management that something must be done to improve the outflow capabilities, so that when and if the BIG ONE occurs, you won't have flammable or other dangerous materials floating through your facility and causing additional problems. If you have dock areas train in these areas as well. Utilize any and all agencies that would be involved in actual events. Coast Guard, EPA, police, government agencies, etc. It used to be this was a "we can't do this because they will be involved in our business". But consider the fact that if events do occur, they will have your trust, and will be more willing to work with you. It works!

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# Aviation Fire Fighter Training With Draeger

World economics and an ever increasing global trade have created unprecedented growth within the aviation sector, resulting in airports becoming not only the controlling centres for air traffic around the world but, also, the transport hubs of modern life. Aviation fire protection is a well documented and commonly discussed topic within the international arena and, in line with the growing airline industry, there is a need for greater logistical and operational considerations in relation to aviation emergency services.

**By Greg Barber**

Product Specialist,  
Draeger Ltd

**I**t is just this sort of consideration that has led Cardiff International Airport and Bangkok's new Suvarnabhumi Airport to install Draeger aircraft fire simulation systems.

## Cardiff – a UK first

The Cardiff system is Draeger's first UK Aircraft Fire Simulator. Custom built to suit the needs of the airport fire service as part of a turn-key contract, this unique steel aircraft mock-up simulates the majority of aircraft types operating at the Welsh site.

Computer controlled and providing safe, realistic training on both single and twin-aisle aircraft, it comprises two sections replicating Boeing 767 and

Dash 8 aircraft. In addition and because the rig is fuelled by low-emission eco-friendly liquid petroleum gas (LPG), rather than the industry standard for aircraft fuel kerosene, it also improves the airport's carbon footprint.

Bringing state-of-the-art firefighting simulation to Cardiff International Airport, the system was built by Draeger in Germany and was assembled, installed and commissioned by Draeger in the UK in just a few weeks.

Ray Imperato, Senior Airport Fire Officer at Cardiff International Airport comments, "This new training rig will give us the most up-to-date facility in the UK. Thirty metres in length, it offers 17 different computer-simulated firefighting scenarios



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from cockpit fires to fires starting in the galley, toilet, landing gear, seats, fuselage and engines. As well as a ceiling flash fire, it also incorporates an external fuel spill fire area. Providing a superb facility for the intensive training courses that we extend to other fire brigades, it will also be used by those working in industry."

He adds, "We chose Draeger because of its' reputation for quality and reliability with systems of this kind. We know that the company has recently installed both Boeing 747 and Boeing 737 rigs at the New Bangkok International Airport and has the capacity and expertise to develop fire-training simulators for a wide variety of aircraft including the world's largest airliner, the new Airbus A380. I am proud to say that we have also built a reputation as a leader amongst the UK airport fire services and we are thrilled to be the first to introduce such an advanced training rig into the UK."

Complying with the latest regulations for fire training systems, the rig is equipped with a computer control and monitoring system which enables both training scenarios and procedures to be created.

Built with safety in mind and incorporating an automatic monitoring system, it also features Draeger gas detection sensors, temperature sensors and a remote support service via data interface. In addition to automatic shutdown in the event of a gas leak or excessive heat generation, the system includes several emergency stop buttons which, once activated, will automatically shut down the simulation and start ventilation to remove smoke and cool the simulator.

For optimum water conservation, any water generated during the training exercises can be recycled and used again in certain applications, such as when cooling the mock-up's steel structure.

Meeting the requirements of the ICAO (International Civil Aviation Organisation), the use of this system means that firefighters can be trained to an appropriate level at their own base



without having to go to an external training station. In addition, by providing an exact replica of the aircraft on which they will normally work, it can only improve the overall effectiveness of their firefighting and rescue capabilities and, as a result, can significantly improve safety levels.

Draeger Safety has supplied fire training systems to airports in Europe and Asia including Gran Canaria, Bangkok and Kuala Lumpur and is currently executing further orders in North America and Europe. Custom designed to meet the specific needs of the airport fire services, they can be made to scale or full size and are ideal for training crews in line with ICAO aircraft firefighting training requirements.

#### **Bangkok prepares for the future**

Since it opened in September, 2006, the Suvarnabhumi Airport has been handling around 45 million passengers a year. Five of its 51 gates are already equipped to handle the new Airbus A380 and the three stations of the Aircraft Rescue and Fire Fighting (ARFF) Department are manned 24 hours a day for firefighting, rescue missions and fire prevention purposes.

Whilst the ARFF may be required to respond to fire alarms that actuate in the terminal buildings or other incidents that occur on the airport grounds, their primary task is the protection of aircraft and their occupants. History has shown that around 80% of all aircraft accidents happen during the take-off and landing phase and, for this reason, emergency personnel must receive regular response training to ensure that they are ready for every eventuality. As with all training, it must be realistic, safe and repeatable whilst limiting its impact on the environment.

Developed to meet these needs and help emergency personnel to maintain the required state of preparedness in line with international regulatory requirements, Draeger Safety offers a wide range of turnkey aviation training systems, the very latest of which can be found at Suvarnabhumi Airport. Comprising a Training Facility complete with a Passive Aircraft Trainer (PAT) and a Fuel Spill Trainer (FST), the project also included a self-contained breathing apparatus (SCBA) Training Gallery and the provision of a complete Control and Operating System.

As the prime contractor, Draeger Safety was



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responsible for the entire co-ordination and integration of this complex turn-key project. Involving a carefully orchestrated combination of regional and head office support, it also called for cultural understanding and, because several aspects were produced locally, a solid international project management capability.

The 2.6 hectare Training Facility is located directly next to the new terminal and is home to three separate trainers, all of which are controlled via the central computer terminal housed within the control building.

#### **Passive Aircraft Trainer**

The PAT is a wide bodied, multi-level aircraft trainer in the form of a full size replica of the Boeing 747. Representing the very latest in the Draeger PAT range, it can be used to perform various incident scenarios and practice evacuation procedures. Constructed using over 250 tonnes of corrosion resistant steel, it contains many realistic features and can be filled with cosmetic smoke for increased realism during search and rescue simulations. Featuring compartment settings and door openings, it also incorporates accurately scaled engine nacelles and an evacuation slide from the Gull Wing door on the upper deck.

Equipped with Draeger respiratory equipment and thermal imaging cameras, the trainer allows rescue personnel to comb the internal areas in the search for passengers, crew members and the cause of the incident. For added realism, numerous 75kg mannequins can also be strategically placed throughout the aircraft.

#### **Fuel Spill Trainer**

Complete with a Boeing 737 replica at its centre, this state-of-the-art module is designed to simulate a fuel spill fire. Using liquid propane gas (LPG) to generate flames, whilst maximising safety and minimising environmental impact, the system incorporates a wide range of safety systems and proven control techniques.

With a total surface area of over 750 sq m, it is obviously important that a realistic and versatile training environment is maintained. As a result, the Draeger FST incorporates a total of 66 individually controlled sections which can be set, by the operator, to run at different flame heights and at different times.

The module also benefits from Draeger's unique Media Detection system and features a total of 132 sensors that automatically detect the use of extinguishing media and cause the fire(s) to react accordingly. In addition, the computerised system is able to control the spread of fire to accurately represent a real situation. In addition

**The Draeger FST incorporates a total of 66 individually controlled sections which can be set, by the operator, to run at different flame heights and at different times.**

to other training foams, the two most commonly used foam types, i.e. Film-Forming Fluoroprotein (FFFP) and Aqueous Film Forming Fluorochemical (AFFF) are fully compatible with the trainer and can be mixed with water to produce finished foam.

In terms of longevity, the rigours of repeated live fire training could obviously take its toll. To provide ongoing protection, the mock up incorporates a water drenching system along the length and breadth of the B737 replica which ejects a protective layer of water over the fuselage at a rate of 10.2 ltrs/min/sq m in line with NFPA 15 regulations.

#### **SCBA Training Gallery**

SCBA sets are provided to all operational aviation fire service personnel for respiratory protection



from smoke, toxic fumes and other substances. As a leading manufacturer of SCBA, Draeger has a long history of supplying comprehensive training galleries to compliment this life preserving apparatus.

Located next to the two aircraft trainers, the additional SCBA facility provides heat, humidity, cosmetic smoke and confined space training, and enables search and rescue scenarios to be put into practice. Providing both new recruit training and skills maintenance, it ensures that all personnel are able to complete live training prior to deployment. Different procedures, such as evacuation for instance, can be rehearsed safely by sending firefighters into a smoke logged Boeing 747, whilst the integral safety procedures allow constant communication to be maintained.

### **Control and Operating System**

A central computer runs the entire facility from a control room which overlooks the training ground. Comprising a proven PLC hardware configuration and a Windows based operating system, it provides real-time information to the controller in English, German or the local Thai language.

The ease and simplicity of the operating system is testament to Draeger's design team and engineers. Not only does it perform self-diagnostic checks to ensure full and correct system status prior to training, but it also captures a wide range of data for use by the training and maintenance teams during post-training analysis.

### **Other applications**

Facilities such as these can obviously provide training for a wider spectrum of needs than simply live fire or search and rescue training. Other applications include major incident training, command and control training and counter terrorist applications. By working closely with Draeger, aviation firefighting systems can be developed to suit specific needs and workplace scenarios, lifting the burden of training and ensuring that personnel and equipment are equal to the demands placed upon them.

Drawing from its wealth of experience in the manufacture of personal protection and detection products, and in developing breathing gas and workshop systems, Draeger operates from a truly global platform. As such, it offers a strong regional presence to support each training installation

throughout its life via local offices and staff. The advantages are clear, not only can Draeger offer language capabilities and local knowledge, but it can also offer fast response times and be on hand to discuss and develop future system enhancements.

Draeger Safety division offers products, services and system solutions for all encompassing Risk Management such as personal and facility protection. Customised system solutions include workshops, training and breathing gas management systems, diving, rescue and high temperature training systems, and tunnel rescue trains.

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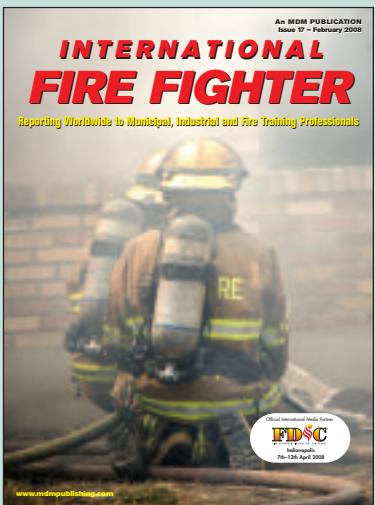
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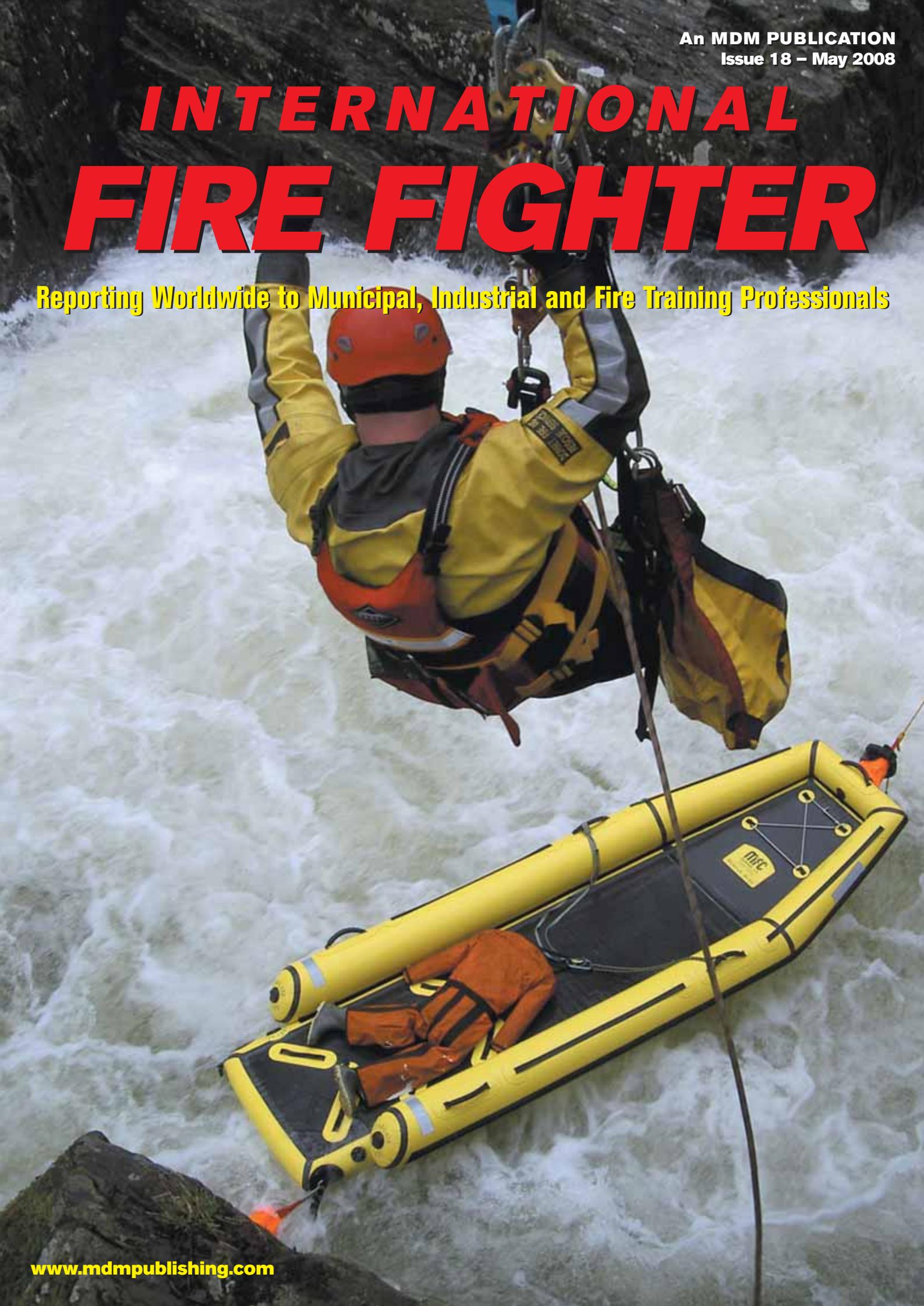
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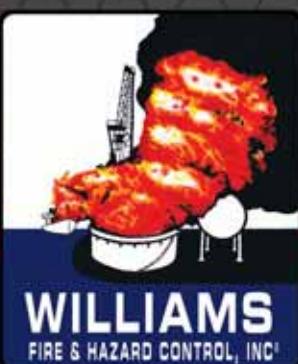
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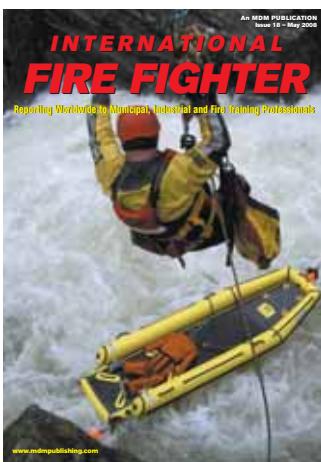
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# Prioritise Fire Fighter Safety

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ICE\* – Intelligent Contrast Enhancement is the hottest innovation in firefighting thermal imaging today. It is the new essential safety enhancement for Firefighting Thermal Imagers, only available in the ISG 1000 SERIES – the new range of firefighting cameras proudly presented by ISG, available in two models, SD1000 (Up-to-Face Viewing) and K1000 (Standard LCD Viewing).

The SD1000 is the only Firefighting Thermal Imager in the world that provides superior performance with the versatility of up-to-face viewing or viewing at arms length. In dense smoke situations, the image is visible without interference from smoke or reflections from external light sources. Innovative optical design means it can also be viewed at arms length for team viewing. By eliminating reflections from ambient light, this imaging system also enables the display to be seen clearly in outside environments or when fighting forest fires. The capability of this viewing system makes SD1000 the only firefighting camera that is truly universal. The second model, K1000 is available for those who prefer the standard wide-angle LCD viewing configuration, providing the same superior performance in a compact package.

ICE\* is the new technology developed to enhance thermal imaging performance for firefighting applications, innovated by ISG's in-house technologists. This feature enables the 1000 SERIES to provide the clearest background image even when viewing the hottest scenes, far superior to any other Firefighting Thermal Imagers available. This feature complements our standard exclusive safety features "Thousand Plus Mode" and "Three Sense Modes". The combination of ICE\* and our standard features allows the Thermal Imager not only to select the best imaging mode for the scene but also to enhance background contrast when needed – particularly vital when viewing extreme temperatures in Low Sense or Thousand Plus Modes – automatically with no user intervention. The firefighter can now see even more:

- ISG's trademark image clarity in scenes up to and above 1000°C
- Simultaneous imaging of background detail, as clear as if the fire were out



*The New ISG SD1000. ICE\* is now available as a free option with SD1000 or K1000*

- Single colour palette for ease of interpretation and reduced training
- Simplified, fully-automatic mode switching Combining ICE\* – Intelligent Contrast Enhancement with ISG's sensational Thousand Plus Mode and Three Sense Modes ensures the user sees the clearest and most detailed image at all times, enabling the best-informed decisions no matter how severe the conditions or how high the temperature.

The simplicity of single button, fully automatic operation provided by ISG's 1000 SERIES Thermal Imagers allows the firefighter to concentrate on fighting fires. Combining this with ISG's ultimate imaging performance and extra headroom for flashover situations equates to a breakthrough in firefighter safety.

IFF

\*Patent pending



For more information about the ISG 1000 SERIES contact:  
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# AgustaWestland Fire and Rescue Flies Ahead with Draeger BA

Following a three month trial with breathing apparatus (BA) from three different manufacturers, the AGUSTAWESTLAND FIRE AND RESCUE SERVICE at Yeovil has chosen the new Draeger PSS 7000 BA complete with PSS Bodyguard II electronic monitoring capabilities. The sets, which went live in November after just one week of training, were selected for their ease of maintenance, future system expandability and proven brand reliability.

Paul Smith, Station Commander at the AgustaWestland Fire Service explains, "Not only have we become the first non-local authority fire service to use the new system in the UK, but our firefighters are now benefiting from the very latest BA technology from Draeger. Modular in design, the set can also be easily enhanced in the future to bring us data storage capabilities as well as electronic monitoring and telemetry. This is particularly important to our management team who are keen to ensure that we continue to offer the best levels of safety to our firefighters within this busy aerodrome environment."



He adds, "Having used Draeger PA94 BA sets for the last 13 years, we knew that they were reliable and liked by our crew and, even though the PSS 7000 is totally new, the ergonomics of the design meant that it still felt like a Draeger set as soon as it was put on. Fitted with 9 litre, 300 bar composite cylinders, the sets have also been supplied with the F2 mask which offered a fuller field of vision and which was something that was of prime importance to us.

"It is still early days," he concludes, "but our firefighters are very pleased with

the new sets and have quickly grown accustomed to the automatic operational features of the Bodyguard II. We are also looking into the possibility of adapting other parts of our kit and will be obtaining Bodyguard software to allow us to download vital information."

Forming part of a revolutionary, complete system solution from Draeger Safety, the new Draeger PSS 7000 BA has been specifically designed with the needs of firefighters in mind. Developed by professionals for use in even the most hostile of environments, this innovative set can be easily and quickly configured to suit different operational requirements and provides seamless integration with facemasks, head protection and communications equipment. In addition, the Draeger PSS 7000 combines a wide range of features to maximise comfort and minimise both stress and fatigue, and is ideal for use with personal monitoring and/or telemetry systems.

The PSS Bodyguard II electronic monitoring unit is the result of extensive user consultation and combines the benefits of the original Bodyguard with a number of additional product innovations. Offering a host of previously separate warning and monitoring devices within a single instrument, it utilises simple push-button controls to provide fast access to essential information.

For example, an integral LCD display provides accurate and continuously updated data in an easy-to-read pictogram format. This includes time to whistle, which is calculated on current air consumption and is refreshed every second, digital pressure reading in bar, a simulated analogue gauge and temperature indication. In addition, every time Bodyguard II is activated it automatically carries out a series of self-tests which can include a high pressure leak test.

Draeger Safety division offers products, services and system solutions for all encompassing Risk Management such as personal and facility protection. Customised system solutions include workshops, training and breathing gas management systems, diving, rescue and high temperature training systems, and tunnel rescue trains.

**Further information is available from:**  
**Paul Harvey, Draeger Safety UK Limited**  
**Ullswater Close**  
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## New MicroLed Plus: R65 directional LED lights

FEDERAL SIGNAL VAMA is pleased to introduce the new MicroLed Plus. A Sputnik LEDs light approved under European Regulation R65.

The MicroLed Plus is a compact light made of LEDs, inspired by our successful light of LEDs MicroLed Sputnik. Microled Plus incorporates the latest technological advances which provide a high-powered light in accordance with the European Regulation R65 , high dissipation capacity and watertight.

The MicroLed Plus has 4 Sputnik LEDs of 3W with high intensity in blue, amber or clear. A external flash allows you to connect up to 8 external units, the ability to select the combined operation up to 4 channels, as well as eight flashing modes that can be selected through an external switch.

The Light MicroLed Plus and the flasher have bivoltage, which provides the greatest versatility on the whole.

Two mounting kits: flush and surface and an assortment of colours complementing the range.

Its small size make this light the flattest



of the market, facilitating the installation on any surface.

It is available too, the version MicroLed Plus-V for vertical mounting, also approved by the R65.

**Further information is available from:**  
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Above all

# IVECO MAGIRUS supplies 45 special rescue vehicles to Turkey

The order books of IVECO MAGIRUS Brandschutzechnik GmbH are full. Currently, the company has one particular order that is being shipped which is, in several respects, quite extraordinary – exceptional not only regarding the scale of the delivery but also with regard to the type of vehicle which was ordered. It concerns 45 highly mobile multi-purpose vehicles for heavy duty rescue operations, which are also described more informally as "rescue vehicle with crane". The entire fleet will be stationed in and around Istanbul, Turkey.



The basis for the special vehicle is provided by a customized off-road chassis supplied by the American manufacturer, GPV (General Purpose Vehicles), which was assembled using different components according to the customer's requirements. The chassis with the drive configuration 6x6x6 have each a gross vehicle weight of 27,000 kg and is driven by a Caterpillar engine with 298 KW / 400 hp. Power

transmissions to the three axles is carried out by means of a ZF Ecomat 6-gear gearbox. All three axles are steerable which means the vehicle is extremely manoeuvrable.

Through a levelling mechanism in the axle springs, the chassis can adapt to lateral and longitudinal inclinations of the ground. The driver's cab has been constructed using aluminium sheet technology and is designed for one driver and two crew members. For the superstructure, IVECO MAGIRUS has used the thousand fold tried and tested AluFire construction. Because the body is elastically mounted on the all-wheel chassis, the roller shutters on the equipment lockers can also be opened also on extremely rough ground conditions without any problems.

The six equipment compartments provide generously-space storage room for the fire-fighting gear which is in principle based on the loading set-up of a RW rescue vehicle. For tasks involved in technically-difficult rescue operations, additional lifting gear, hydraulic spreaders and cutting tools are on board. If searching for buried persons, e.g. after an earthquake, the vehicles are equipped with several specially designed detecting devices.

A hydraulically-driven winch with 75 m cable length and 58 kN tractive powers is installed in the chassis. The power generator is driven from



the chassis and supplies 23 kVA. A crane is mounted at the rear of the vehicle and has a reach of 12 metres.

Delivery of the 45 vehicles started in February and will be completed in summer 2008.

With the realisation of this very special and sophisticated vehicle design, IVECO MAGIRUS has once again proven its capability and technological expertise which go far beyond just standard and serial solutions.

If you have any questions or require further information, please contact  
Alfred Bidlingmaier:  
Tel: +49 731 408 2564  
Email: alfred.bidlingmaier@iveco.com

## University of Nevada, Reno Fire Science Academy Training Courses offered March-December 2008

The UNIVERSITY OF NEVADA, RENO FIRE SCIENCE ACADEMY (FSA) has trained firefighters and emergency personnel from businesses and government agencies from all 50 states and nearly 40 countries. One of the finest emergency-response training programs and facilities in the world, the FSA campus in Carlin, Nev., offers scheduled open-enrollment courses as well as customized training.

The FSA 2008 course schedule provides state-of-the-art training in areas of expertise including crisis and emergency management, industrial fire fighting, wildland fire fighting, aircraft rescue and fire fighting (ARFF), rescue and hazardous materials. The campus features multimedia classrooms, support facilities and state-of-the-art training grounds and props for hazardous materials, aircraft, structural, mine rescue and extrication exercises. Burnable props utilize liquid petroleum fuels in real-life situations.

Open-enrollment courses are held at the University of Nevada, Reno Fire Science Academy, 100 University Ave., Carlin, Nev. A leadership series is held at the University's Redfield Campus in Reno, Nev. Training also may be customized and conducted at an organization's facility anywhere in the world.

For a schedule of the Fire Science Academy 2008 courses visit [http://fireacademy.unr.edu/documents/2008\\_Schedule\\_Flyer.pdf](http://fireacademy.unr.edu/documents/2008_Schedule_Flyer.pdf) or <http://www.fireacademy.unr.edu> or call the University of Nevada, Reno Fire Science Academy at (775) 754-6003 or toll-free, 1-866-914-0015

## Hytrans Fire Systems

HYTRANS FIRE SYSTEMS is a Dutch company manufacturing large capacity Mobile Emergency Water Supply Systems. Hytrans Fire Systems gives the industry the possibility to create up to 12" mobile hydrants over 1500 meter (or more), operational in only 30 minutes. A complete system is made up of three major parts: the HydroSub pump unit, the Hose Layer Container and the Hose Recovery Unit. Hytrans pumps use hydraulic driven submersible pumps, so suction loss is no longer a problem. Hytrans HydroSubs can take water from basically any open water source available, with a maximum capacity of up to 22,000 lpm @ 12 bar. The hose layer container makes it possible to lay hose with speeds of up to 40 km/hr! The hose Recovery Unit enables the crew to retrieve 1000 mtr of 6" hose in 30 minutes, rendering the complete system ready for the next emergency in minimal time. A complete 3500lpm water supply system over 1000 mtr can be set up with only 3 persons in under 15 minutes!

Over the last couple of years, the Hytrans High Volume Pumping Systems have been deployed at some large European oil tank and refinery fires like Buncefield (UK) and Münchmünster (GER) and were used during the recent 2007 floods in the UK.

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For more information: [www.hytransfiresystem.com](http://www.hytransfiresystem.com)





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Netherlands

# Skum™ Protection for new Jebel Ali Storage Terminals

A complete fire detection and SKUM™ foam fire firefighting system has been supplied to UAE-based Consilium Middle East (FZC) and installed to protect the new EMOIL petroleum storage and the new EMDAD aviation fuel storage and distribution terminal at the Jebel Ali Free Zone in Dubai. It comprises foam skids, foam tanks, foam pourers, bund pourers, a deluge system, an LHS linear heat sensor detection system, and a hydrant system, together with foam and water monitors and AR-AFFF 3x3 alcohol-resistant aqueous film-forming foam concentrate.

Installed primarily to protect hydrocarbon storage tanks, pump houses and truck loading bays at the storage terminal, the integrated installation also safeguards the pipeline that supplies aviation fuel to Dubai International Airport. EMOIL is a joint venture between Emarat [Emirates General Petroleum Corporation], BP Global Investments, and Trafigura Beheer, while EMDAD is a joint venture between Emarat, Air BP and Shell. Installation of the SKUM equipment was undertaken by the Italian engineering, procurement and construction specialist, Belleli Energy.

The facility is being used for both blending and storing gasoline products to meet Emarat's own requirements for high quality gasoline, as well as supplying local and regional markets. Built on a 46,000 square metres site, it includes nine storage tanks with a total capacity of 228,000 cubic meters. Of this, the aviation fuel storage facility has a 155,000 cubic metre capacity tank farm and includes a 57-kilometre cross-country 300mm diameter pipeline to transport the jet fuel direct to the airport.

Fredric Pettersson, Regional Sales Manager for foam and foam hardware at Tyco Fire Suppression & Building Products, Middle East, points to the ability to provide a single-source supply solution comprising both the foam agent and the delivery system as a key factor in securing the order. He comments: "SKUM is very much in the solutions business, so it has amassed a huge bank of knowledge in

terms of the risks inherent in this type of strategic, high value, high hazard site. This has allowed us to develop a fire safety model for the terminal that is in around-the-clock readiness to react instantly to any spillage or fire emergency on the site."

The importance of this capability is endorsed by Mr M. M. Usman, Operations Manager for the Terminal, who comments: "Health, safety and environmental issues are very important in an environment such as this and we have very high standards, which are strictly enforced, according to both industry standards and those of the joint venture partners".

The SKUM brand is recognised globally as the industry's leading provider of dependable and efficient firefighting solutions for high value, high risk petrochemical, aviation, marine and power plant applications.

IFF



Further details on **SKUM** – Skum is the Swedish word for foam, which is pronounced "skoom" – solutions and expertise can be found at [www.skum.com](http://www.skum.com), or are obtainable by email on [tspmarketing.emea@tycoint.com](mailto:tspmarketing.emea@tycoint.com), by telephone on +46 303 57700, or by fax on +46 303 58200

# Yorkshire Purchasing Organisation (YPO) chooses Bristol Care™

After evaluating a number of alternative managed laundry care service suppliers, YPO has moved from a commercial laundry supplier in favour of a specialised managed care service for its firefighter PPE and has now signed a 4 year contract with Bristol Care™.



The contract, which calls for the 'supply of laundry for the maintenance of firefighter uniforms', commenced in January 2008. South Yorkshire have signalled their intention to begin using the service from April 2008 with other Yorkshire fire and rescue services actively considering adopting the Bristol Care™ facilities in the near future. South Yorkshire Fire & Rescue are existing Bristol Uniforms' customers for the supply of firefighter PPE. They became the first fire & rescue service in the UK to specify PPE for its firefighters using a new outer layer fabric using red PBI™, a new moisture/thermal barrier using Crosstech Airlock™ and combined into a garment design which fully meets the new PPE standards introduced under EN469:2005.

Helen Wardman, YPO's Protective Clothing and Workwear Buying Manager said, "In tendering for a supplier we were looking for a professional service which included the ability to provide not only routine repair and laundry facilities but also the capacity to deal with PPE contaminated with, for example, blood borne pathogens and asbestos, which are available to us from Bristol Care™. We were impressed with the quality of their tender submission and the level of detail provided".

Philip Tasker, Bristol Uniforms' UK Sales

Manager added, "This is a very positive development which allows Bristol Care™ to provide the managed care services for PPE supplied by Bristol Uniforms thereby enabling us to provide a comprehensive, across the board, supply and care service. It also means that the number of UK firefighters now covered by Bristol Care™ is approaching 17,000. This makes us clear market leaders and accounts for around 30% of all UK's firefighters".



For more information about Bristol Uniforms or Bristol Care™ please contact Roger Startin, Bristol Uniforms Ltd on 0117 956 3101 or email [roger.startin@bristoluniforms.com](mailto:roger.startin@bristoluniforms.com)

## Vetter Aircraft Lifting Bags, the gentle giants

VETTER Aircraft Lifting Bags are available in 8 sizes with between 5 to 25 individual bag compartments and lifting capacities from 3,3 t up to over 60 t and lifting heights from 100 cm up to 400 cm. Due to the construction these gentle giants afford the advantage of very low insertion heights (deflated) from only 7 cm (5 individual compartments) up to 30 cm (25 individual compartments).

The single chambers are assigned to the control mechanism with a numerical identification on the chambers and control mechanism. You can precisely adjust the bag chambers to the position of the aircraft in virtually any salvaging position with separate control of each bag chamber.

Because of the ever increasing number of aircraft fuselage and wing shapes have made contour matching an essential factor in the field of aircraft recovery using pneumatic lifting bags. In cooperation with the authorities of Frankfurt Airport Vetter advanced the existing recovery system.

One of the main advantages of the contour matching system is the low pressure point loading on sensitive aircraft components.

Additionally to the great stability these system also affords a high degree of safety and meets at the same time the requirements of aircraft manufacturers.

In the first step, a pneumatic aircraft



lifting bag is positioned under the wings of the aircraft to be recovered. Afterwards so-called vacuum bags are positioned on the lifting bag at the facing side of the fuselage. These vacuum bags are similar to vacuum mattresses. When a vacuum is created in the bag, it will match the contour and therefore stabilize the aircraft.

Loss of the lifting capacity – in consequence of the contact area – can be avoided.

Larger and smaller intermediate spaces can additionally filled out with single chamber bags or filler sacks.

A multiplicity of accessories, e.g. lifting tackles and towing systems or ground enhancements complements the aircraft recovery system.

**Further information:**  
**Vetter GmbH**  
**A Unit of IDEX Corporation**  
**Postfach 1355, D-53905 Zülpich**  
**Tel: +49 (0) 2252/3008-60**  
**Website: [www.vetter.de](http://www.vetter.de)**

# Hygood® Suppression Solutions Provide Choice & Performance

As part of its commitment to meeting all of the market's demands for high-performance total flooding fire suppression systems for critical asset protection, the Hygood® brand offering includes SAPPHIRE®, the very latest in environmentally-acceptable technology, the i3® inert gas solution, and the new low-cost HYGOOD CO<sub>2</sub> [Carbon Dioxide] high pressure system. All three solutions are noted for their zero or negligible impact on the environment and their unerring reliability. All are approved to the highest international standards. The current portfolio also includes HYGOOD FM-200 clean agent fire extinguishant.

**S**APPHIRE uses 3M™ Novec™ 1230 Fire Protection Fluid. It is stored in containers as a low vapour pressure fluid that, when released, discharges as a colourless and odourless gas. Typical total flooding applications use a low concentration that is well below the agent's saturation or condensation level. After discharge, the agent is dispersed through natural ventilation, leaving no residue to damage sensitive electronic equipment; it is also non-conductive and non-corrosive.

SAPPHIRE has a negligible impact on the environment with an insignificant global warming potential, lower than any of the halocarbon agents acceptable for use in occupied spaces. It has zero ozone depleting potential and a remarkably low atmospheric lifetime of three to five days, compared with 107 years for Halon 1301. SAPPHIRE has a global warming potential of just "one", which means that several thousand kilograms of the Novec 1230 fluid would have to be released to have the same impact on climate change as just one kilogramme of a typical alternative HFC or hydrofluorocarbon.

On release, the colourless, odourless, electrically non-conductive, and non-corrosive gas permeates the entire protected area and extinguishes the fire by absorbing heat in the fire area to the point where the combustion process in unsustainable and the fire dies. There is no damage to sensitive electronic equipment or documents during discharge, and with no agent clean-up required, business critical installations can be back in operation in the shortest possible time.

i3 is another HYGOOD solution that has impeccable environmental credentials; as an inert gas system it neither adds nor takes anything away from the environment. This is because it is a pure 50:50 mixture of Argon and Nitrogen, which already circulate freely and naturally in the atmosphere. i3 forms no breakdown products and therefore minimises the risk of consequential damage to the carefully balanced ecological system. It has precisely the environmental credentials that the market is seeking: zero ozone depletion potential; a zero atmospheric lifetime; and zero global warming potential. So, to organisations specifying that a non-chemical suppressant is of overriding importance, the i3 inert gas system is an attractive option.



It is non-conductive and non-corrosive, and works by lowering the oxygen content of the protected area to a point that will not support combustion, but is still sufficient to sustain human life. It is non-toxic, and will not harm sensitive electronic equipment or documents, and is safe to use in enclosed areas where people may be working.

By comparison, CO<sub>2</sub> is certainly not a system to be used for total flooding applications in normally occupied rooms or enclosures, as the discharge of CO<sub>2</sub> in fire extinguishing concentrations would be lethal to room occupants. However, it is still an extremely effective fire suppression agent and, in all probability, has safely extinguished more fires in unoccupied enclosures than any other gaseous suppression agent.

The new HYGOOD CO<sub>2</sub> offering uses individual premium-build steel storage containers that can be manifold-linked together to enable rapid, simultaneous discharge. The gas is stored under pressure and is piped to the protected enclosure, where it is released via a network of piping and strategically located discharge nozzles. Two or more hazard areas can be protected with a single group of containers by means of directional or selector valves.

Further information on SAPPHIRE, i3, HYGOOD CO<sub>2</sub> or HYGOOD FM200 is available by telephone on +44 (0) 1493 417600, by fax on +44 (0) 1493 417700, or via email at tspmarketing.emea@tycoint.com

# Field Expedient Bleeding Simulation System (FEBSS)



Originally designed for training U.S. Army Combat Medics and Combat Lifesavers, the FEBSS is the most efficacious bleeding simulator anywhere. The FEBSS allows trainees the ability to actually SEE bleeding wounds during initial treatment. Trainees no longer have to use their imagination when applying bandages, dressings, and tourniquets to simulated traumatic casualties! Evaluators no longer have to pour buckets of simulated blood on simulated wounds! The FEBSS can be concealed within or worn on any simulated mannequin OR live casualty! A total of 8 bleeding injuries can be controlled remotely up to 50 feet away!

The FEBSS keeps casualty simulation simple. One button turns the system ON and one button turns the system OFF. No software updates are needed so ANYONE can operate the FEBSS! Each bleed can be controlled to simulate any combination of capillary, venous, or arterial bleeds. This forces the trainee to prioritize wound treatment during the initial assessment of simulated traumatic casualties.

Until now, bleeding wounds were simulated by one of two methods. One method consists of squeezing an I.V. bag full of simulated blood with a hose routed to a simulated bleeding injury. The simulated casualty squeezes the bag during initial treatment creating a trickle

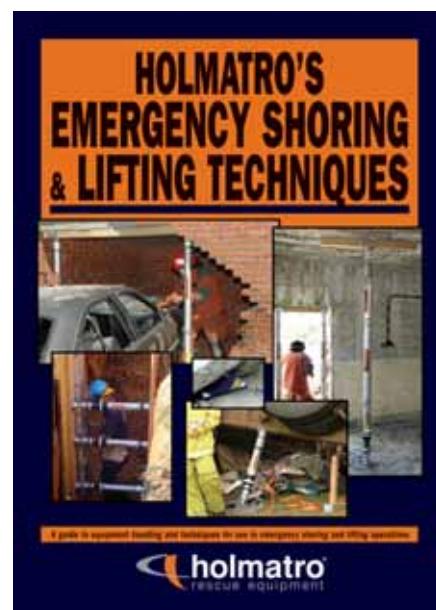
of blood. This forces the live simulated casualty to concentrate more on making the wound bleed, rather than ACTING like a real traumatic patient! Both the wound AND the simulated casualty perform poorly, robbing the trainee of the emotional and psychological stress factors of a true emergency!

The second method of creating a bleeding wound forces the evaluator to pour or spray simulated blood on simulated casualties. More often than not, the trainee and the evaluator have a CONVERSATION rather than a training event! Trainees are again robbed of the emotional and psychological stress factors which make up a TRUE emergency.

The FEBSS solves these problems. It creates CHAOS at the touch of a button, causing trainees to freeze and forget what they were taught. It allows them to train until they get it right, while preparing them for lifesaving street medicine.

**For more information contact:**  
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**Tualatin**  
**Oregon 97062**  
**Tel: 1-800-770-SKED**  
**For product pictures please visit**  
[\*\*www.skedco.com\*\*](http://www.skedco.com)

## New training book from Holmatro



### 'Holmatro's Emergency Shoring & Lifting Techniques'

HOLMATRO RESCUE EQUIPMENT introduces a compact yet comprehensive guide to equipment handling and techniques for use in emergency shoring and lifting operations: 'Holmatro's Emergency Shoring & Lifting Techniques'. This 100-page book aims to provide a basis to the principles of emergency shoring and lifting operations, as required for the safe rescue of persons trapped. These principles reach across a range of specific rescue disciplines being passenger vehicle and heavy goods vehicle rescue, collapsed structure rescue and trench rescue. The book covers all of these disciplines including the various types of shoring and lifting equipment commonly used.

'Holmatro's Emergency Shoring and Lifting Techniques' discusses the topics personal safety, shoring equipment, lifting equipment, hydraulic assist equipment, equipment care & maintenance, load management principles, vehicle rescue, collapsed structure rescue and trench rescue. The book offers a well-balanced mix of theory and practice, and is therefore a valuable training tool. Besides the current English version, the book will be available in other languages soon.

Available through your local Holmatro dealer (see: [www.holmatro.com](http://www.holmatro.com)).

### For more information please contact:

**Holmatro Rescue Equipment**  
**P.O. Box 33**  
**4940 AA Raamsdonksveer**  
**The Netherlands**  
**Tel: +31 162 58 92 00**  
**Fax: +31 162 52 24 82**  
**Email: [info@holmatro.com](mailto:info@holmatro.com)**  
**Website: [www.holmatro.com](http://www.holmatro.com)**

# Waterous Eclipse Series CAFS helps protect International Oil Transport System in Croatia

Famous for its wooded mountains, vast national parks and a coastline that overlooks the Adriatic Sea, the small country of Croatia is home to Central and Eastern Europe's most vital conduit of crude oil – the Jadranski naftovod (JANAF) Oil Transportation System. Designed to carry up to 34 million tons of oil annually (MTA) from the port and terminal of Omisalj, to local and foreign refineries throughout Europe, the pipeline currently runs at roughly 20 million MTA.

In transporting such a large amount of crude oil, keeping the 759km pipeline running safely is critical to meeting the demands for the resources. So in January of last year, JANAF approached one of Croatia's leading fire truck manufacturers, MG-Rijeka, to design and build an advanced firefighting apparatus. The new apparatus would be used to provide emergency fire suppression services for one of the company's main storage facilities at Omisalj terminal.

Located on the northern part of the Island of Krk, Omisalj Bay, is where the crude oil supply comes in and is shipped out. Its strategic location protects the facility from the elements of the wind and water, which makes the loading and unloading operations run efficiently. Omisalj also houses a storage tank farm with a maximum capacity of 760,000m<sup>3</sup> as well as a pumping and metering station located near the port.

To protect this facility, JANAF decided that a highly advanced fire suppression program and apparatus needed to be in place. The apparatus that MG-Rijeka proposed would be the first of its kind in Central and Eastern Europe. Made on a MAN TGA 33.480 6x6 BB chassis, the vehicle featured the first ever Eclipse™ series CAFSystem™ from Waterous that had a bronze-made 2000 GPM CMU Pump and C10C transmission on it. The pump, which also featured a 1000 GPM Foam Manifold, used a Foam-Pro foam proportioner and VPO Iron Priming Pump to deliver the Class B foam.

In addition to the Eclipse pump, the new truck is loaded with advanced technology. With touch-screen controls, controlling the water and foam monitors on the vehicle, controlling the pressure and capacity, alarms, turning on and off the pump, controlling all functions of the foam proportioners, turning on the vehicle's self-protection system, are all simplified for the operator.

Passing all of the customer's performance requirements along with the required Croatian firefighting attestation certifications, the new apparatus was a success. Korina Baresic, general manager for MG-Rijeka was pleased with the apparatus, "The main treasure of MG-Rijeka is our team of engineers, technicians and designers who made this truck a success for our customer. I call them the 'Dream Team'."



Upon delivery of the truck, the MG-Rijeka 'Dream Team' trained the JANAF staff for four days, showing them how to operate it properly. "Training is important to the effectiveness of the vehicle," stated Baresic. "We want our customers to get the best performance possible, especially when the situation calls for it."

The event, which drew some of the country's most notable firefighting and oil industry leaders including the Deputy Minister of Interior from the Ministry of Interior of Croatia and the President of the Croatian Chamber of Commerce, was a monumental occasion for both MG-Rijeka and Waterous. "We were given an excellent opportunity by MG-Rijeka to be a part of this project and it was an honor to work with them," stated Dejan Marinkovic, Waterous Sales Manager for Central and Eastern Europe. "Since the delivery of the first truck, JANAF has bought another with our bronze Eclipse on it and they are already looking to buy a third. We even had their safety manager, Mladen Padesic and his deputy Vlado Zoric recently visit our factory along with MG-Rijeka's owners."

Baresic was excited about the collaboration with Waterous. "Thanks to their understanding and patience, the quality of the products and the efforts of their staff, our customer has been reaching excellent results."

For more information visit  
our website at  
[www.waterousco.com](http://www.waterousco.com)

# Haztec achieves The Queen's Award For Enterprise: International Trade 2008



Lightbars to Electronic Siren Systems which we supply to Emergency and Municipal Services throughout the world.

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As Bryn Tennant CEO of Haztec commented 'This award emphasises the meaning of our registered slogan 'GLOBAL WARNING'!'



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## MFC Survival provides DFRMO with Water Rescue Kits

MFC SURVIVAL LTD was approached by the Defence Fire Risk Management Organisation (DFRMO) to help them come up with a solution for their Level One water awareness requirements.

Working together with the DFRMO, MFC Survival were able to use their experience and research gained from working with Fire and Rescue Services to put together a complete solution in the form of a Level One Water Awareness Kit for the DFRMO. This kit complements the company's already well established water rescue equipment which includes lifejackets, sleds, stretchers, airtrack, hose inflation kits, drysuits and throw lines as well as servicing the equipment.

MFC Survival's water rescue kit contains three MFC 275N Single Chamber Lifejackets, a technical rescue PFD, two throwlines, a loudhailer, clip on blue lights and a water rescue lanyard, all contained in one waterproof kitbag. This can be tailored to suit customer requirements.

Phil Jones, Commercial Director of MFC Survival says 'The DFRMO have purchased nearly one hundred kits from MFC Survival. We are always pleased to look at new product ideas and provide solutions for our customers, as in this case. We hope the relationship we have built with the DFRMO will be ongoing and we look forward to helping them with future requirements.'

For more information contact:  
**MFC Survival Ltd**  
Tel: + 44 (0) 1443 433075  
Fax: +44 (0) 1443 437846

## Darley Awarded Major US Military Contracts for Fire and Emergency Services

W.S. DARLEY & CO. (Itasca, IL) announced it has been awarded five major defense contracts from the Defense Supply Center Philadelphia (DSCP) in Philadelphia, PA.

Historically referred to as the prime vendor contracts, Darley will provide tailored logistics support for fire and emergency services to the Army, Navy, Air Force, Marine Corps, federal civilian agencies, and state and local governments. Darley received indefinite-quantity, indefinite-delivery, multiple-vendor contracts covering all 5 regions. Each contract has a maximum value of \$800 million.

According to company president Paul C. Darley, "There were 12 bidders, and we are proud to have been selected to serve our country's military forces. We have worked closely with the Department of Defense for about 70 years, and began working on this contract over 4 years ago." The contracts have a 2-year base period, followed by three 1-year options.

For questions or additional information, please contact  
Paul Darley at  
**W.S. Darley & Co. Corporate Headquarters**  
325 Spring Lake Drive  
Itasca  
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Tel: 708-345-8050- 1-800-4DARLEY  
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# Aircraft Recovery Readiness

## - Underestimated necessity!

**By John A. Olsen**

Senior Program Manager, Fraport AG Fire Training Center

The continually increase in air traffic, and the evolution of new large aircraft present significant challenges to safely and effectively deal with a disabled aircraft recovery event. Aircraft recovery is not a simple task and in many cases can be a very challenging and costly for the airport operator and the aircraft carrier. This article looks into the basic aspects of aircraft recovery, addresses the complexities of a recovery incident and emphasizes why airports and aircraft carriers need to better prepared to handle the unfortunate event of a disabled aircraft.

### **The underestimated risk**

Official statistics on the actual number and types of disabled aircraft recovery incidents is not available, research has shown that on an average, each week an aircraft incident needing recovery occurs.

A disabled aircraft, whether a simple or major incident create many challenges for the aircraft carrier and airport operator. When an aircraft becomes disabled on or within the vicinity of the active runway or in any portion of the aircraft

movement areas, airport operations, in many cases, virtually come to a halt.

Regardless of the complexity of the recovery scenario, direct revenue loss to the airport can run quickly into the millions, making the safe and timely removal of the disabled aircraft essential.

Unfortunately, preparation for the safe removal of a disabled aircraft recovery is often not one of airport operators major priorities. Our experience has shown that 9 out of 10 airports and aircraft carriers have not adequately prepared to handle even the simplest recovery event.

In addition, the complexities of the New Large Aircrafts (NLA) like the A380 and B747-800,B777 or the future 787 Dreamliner, will require significant changes in standard aircraft recovery procedures in terms of complexity and needed tooling. The increased weight, height of the wings, low allowable skin pressures and the design in modern wings make new tooling and procedures necessary.

To cope with a potential AR incident and to reduce the loss of revenue airports and aircraft carriers alike need to be prepared and equipped



to safely and expeditiously react to a recovery incident.

As you read on, consider the following:

*Timely removal of an aircraft is the responsibility of the carrier, but what is timely when a runway is closed?*

*Do equipment pools that many carriers currently rely on allow have all the necessary tooling required for your specific recovery event?*

*Can a carrier or airport get the correct adequate equipment in place?*

*If a runway is closed, can equipment even fly into your airport?*

*Can the aircraft carrier deploy the needed tooling and recovery specialist without delay?*

*Can my current equipment deal with the new requirements of NLA?*

*Does the airport have recovery equipment, trained personnel and a comprehensive recovery plan?*

### What is AR?

*Aircraft Recovery is the safe and timely removal of a disabled AC that cannot move under its own power or through the normal use of an appropriate tow tractor and tow bar.*

There are two key words in this definition . . . *Safe and Timely*. The recovery of a disabled aircraft commonly presents challenges of having the right tooling and training to safely recover the aircraft without causing secondary damage. Depending upon the situation, the safe recovery of a disabled aircraft can an in many cases be a timely process. A aircraft is heavy and can damage easily.

Naturally, the priority of the airport operator will be to place priority emphasis on removing the disabled aircraft and getting the airport back to normal operations. For the carrier and insurance company preventing secondary damage is the key objective.

The recovery case can be a "simple" debogging of a landing gear or involve the extensive employment of specialized recovery equipment to construct temporary roads, lift the aircraft and transport the aircraft to a safe location for repair.

Equipment like lifting bags systems, multi-slings, temporary road mats, tethering devices and debogging slings are the basic equipment necessary for a team to operate during a recovery operation. However, the recovery challenges of NLA has forced to take a closer look at current procedures and tooling requirements. Recently new equipment has been developed to cope with the demands of NLA, like the Rapid Recovery Solution (R2S) of RESQTEC. A system that can be easily deployed to lift NLA quickly, with more control and stability then most standard recovery bags and jacks.

### How is responsible

Airport Services Manual (ASM) Part 5 places the responsibility for the timely removal of a disabled aircraft on the aircraft carrier and further recommends that the airport have an established plan to deal with recovery events. In the case of an aircraft recovery, it's not a matter of responsibility, it's a matter of shared interest. When we analyze the effects of an aircraft incident, we can surely agree that it is in the best interest of both the airport operator and air carrier to execute a timely and safe aircraft recovery operation.

### Business Case

Depending on the resources available and the situation, it can take as little as 4 to 8 hours to get a aircraft away from its stranded position . . . however a complete recovery could also take weeks. Inquired costs to a average airport easily run into cost in excess of 2000 Euro a minute (exact cost are hard to state, as it depends on location, airport etc among others). Determining tooling requirements, consideration should be given to the ease of operation and equipment deployment, set-up and operation time.

The question always is how well to prepare and how much money should be invested into establishing an aircraft recovery capability. Ideally one should consider sufficient investment to deal with every scenario, but that can be costly and difficult to achieve. If we put things into perspective,

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airports generally invest significant amounts of money into airport fire and safety programs which is a must. Likewise, equivalent priority should be given to adequately preparing for the recovery of a disabled aircraft. In general a Airport can adequately prepare for most common scenario's with approx 2-3 million Euro's.

### Guidelines

There are some documents that describe how recovery operations should be performed.

Aircraft Manufacturers publish Aircraft Recovery Manuals (ARM) which provides detailed technical and procedural information necessary to recover a specific type of aircraft. They are the most important document for a recovery operation and should be followed.

The International Civil Aviation Organization (ICAO) has recently published a revised version of ASM Part 5. This document provides valuable information and guidelines to assist airports in preparing for disabled aircraft recovery incidents. It is sometimes mistaken that the document is an obligatory document, this is not the case. The document is meant to provide recommendations, guidance and insight into how an airport can prepare for recovery operations. The revised version provides additional guidance on recovery procedures for NLA.

IATA Aircraft Recovery Taskforce (ARF) is the most important platform in the aircraft recovery profession. The ARF is a group of experts from carriers, aircraft manufacturers, aircraft recovery specialist, Airports and tooling manufacturers. The objective of the IATA ARF is to improve aircraft recovery procedures and to create a networking platform to share recovery incident experiences and to foster the development of new aircraft recovery technologies.

### Disabled Aircraft Recovery Preparedness

When an aircraft slides off the end of the runway, gets bogged down and causes the closure of the runway . . . is not the time to start thinking about aircraft recovery preparedness. Have a plan upfront when that unfortunate day arrives that you are confronted with the demanding challenge

of removing a disabled aircraft from your runway is critical! Professional aircraft recovery preparedness is a must for efficient airport operations.

The purpose of the disable aircraft recovery plan is to make suitable arrangements (in advance) to ensure the prompt availability of the appropriate recovery equipment and any experts who may be required.

The best way to prepare for aircraft recovery is to establish a planning team, define your risk potential and raise the awareness at upper level management. Present a business case that is based on "facts" that shows the economical advantages of being adequately prepared, equipped and trained for recovery events. In many cases an airport or airline can obtain an immediate return on their aircraft recovery investment if they are capable of rapidly and safely removing the aircraft from the runway. Remember, a closed runway even for a short period of time can result in the loss of millions.

When purchasing developing procedures, please understand that there are no regulations or standardized procedures that govern equipment requirements or the level and intensity of the training required of personnel performing recovery operations. The ICAO manual Part 5 does not validate or propose any equipment, neither does any other organization like IATA or IATP. IATP is an equipment pools but do not certify or validate. The ARM's of the manufacturers are the best guideline, but may not reflect the latest developments in tooling or procedure if it is an older type aircraft.

Organizations like the Fire Training Center (FTC) of the Fraport AG or RESQTEC help clients with their disabled aircraft recovery planning efforts and assist in business case development. They can assess your organization and present a plan that involves recommendations for equipment, training and recovery procedures based on their clients risk potential. *After budget and a plan is available, choice of equipment can be made. Keep in mind the technological developments that can make your recovery operation easier.*

To learn more about Aircraft Recovery, a Information Workshop is organized each year. Last one was this April. Although by invitation only, for more information please contact RESQTEC. **IFF**



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# Warning Lights and Lightbars – from Bulbs to LEDs

Warning lights as fire-fighters well know are a vital necessity to help safeguard the vehicle and crew responding to an incident. They assist in helping to clear the traffic as well as alerting oncoming traffic of the existence of vehicles and any stationary crew at the scene of the incident.

**By Bryn Tennant**

Over the years the effectiveness of the original types of warning lights has been reduced for a number of reasons. There are today many more users of warning lights along with the increased use of road lights, Neon and/or other types of illuminated advertising signs. These additional lights have all made traditional Emergency Vehicle Lighting less noticeable.

To try to maintain the effect of warning lights over the years vehicle lighting has steadily evolved from a single on/off flashing light to rotating beacons and onwards to today's highly visible Lightbars.

The first Lightbars introduced over thirty years ago had rotating tungsten sealed beams coupled with mirrors to multiply the lighting effect. Sealed

beams were gradually replaced by halogen rotators giving an increased light intensity output and still today this approach is still a popular and frequent choice for certain economical warning needs.

Then in the 90s came the introduction of strobe lights for warning purposes. Strobe brought a higher technology solution. Strobe significantly reduced the battery drain associated with halogen lights along with the opportunity to be able to programme a variety of flash patterns aimed at making warning lights even more effective and attention getting. However, strobe still had some weaknesses to overcome. Strobe lights because of the very short "ON TIME" or burst of light tend to lose their effectiveness during daylight hours. Also

Hong Kong Fire Truck  
with a Generation2  
Lightbar



the burst of energy is in a colour range that washes out colour and all colours can appear to be similar to daylight.

The latest innovation is in using LEDs for warning lighting. LEDs provide a virtually instant on-time and the visual colour will be pure since LEDs produce light in only in a narrow band. So Reds stay Red, Blues stay Blue. LEDs started with what the industry calls Generation 1 LED's. They have only distribution optics and are very directional and had limited intensity except at HV. These LEDs were quickly superseded by much improved and rugged Generation 2 LEDs which had higher outputs and also contained both distribution and collection optics and so were able to provide a larger viewing angle.

Naturally following Generation 2 came Generation 3 LEDs. The Generation 3 LEDs can produce a much larger light output than Generation 2 and are more versatile and capable of larger viewing angles when coupled with appropriate optics.

Although Generation 3 are currently the ultimate in performance for led warning lights they do produce more heat than Generation 2 so it is

necessary to have suitable heatsink capabilities built into the lamp assembly. Generation 2 LEDs are still extensively used as a cluster of LED's. When used this way Generation 2s can produce a light output almost equal to a few Generation 3 with as long a life yet are more economical in certain colours and configurations.

The latest LED lights are far more effective during both day and night than either halogen or strobe, although this can depend on the quality and output of the particular LED's. There are some poor quality LED lights which give very little light output and consequently could be a more of a danger than an asset to the emergency vehicle. When they are used a driver believes his lights are giving some protection by alerting other road users when in fact they can hardly be seen.

Flashing headlights are still a very good means of warning although they give little side warning. However, further developments in LEDs and in the culmination optics now mean that directional LEDs can produce both a vivid front warning coupled with a 180 degree wide angle warning to give excellent side protection. These are particularly good when used in front grille applications on Fire Trucks which tend to have high mounted Lightbars. The high LightBar is great at warning at a distance but has less value in urban congested areas. Wide angle type of directional LEDs lights are also very good for the sides and rear of the Fire Tender as again they can give a full 180 degree warning angle.

The change by many services in many countries from halogen to strobe and more recently to LED has been very significant. LED products have seen an enormous surge firstly in directional warning lights where they are able to be packaged much smaller and installed without the cutting of body-work and continuing in to Lightbars.

There are a variety of reasons for this not least



Generation3 LED Wide Angle Grille Light

*Generation3 LED Lightbar*

the effectiveness of LEDs but also the longevity and reliability with both Generation 2 and Generation 3 LEDs expected to last a minimum of 50,000 hours but more likely 100,000 hours.

Another benefit of LEDs is their much reduced power requirement resulting in the ability to keep the warning lights operating for long periods of time without keeping the engine running. This saves not only fuel and the environment but also extends the life of engine components such as alternators. These are very big advantages and ones which help to justify the extra costs involved in LED products.

This is also reflected in the lack of down time and costs due to their reliability compared with halogen and strobe products which although reliable the cost to change a halogen bulb and with current health and safety requirements effectively preventing an engineer climbing on to a high vehicle such as a Fire truck costing more time and money erection suitable ladder and platform equipment.

Some countries do have very strict and closely monitored requirements for Emergency Vehicle Lighting. In Europe for example and although not compulsory many countries specify the regulation ECE R65 which is a strict test for light output intensity, flash speed, correct colour spectrum and lighting angles. The testing also includes an environmental test for both water and dust ingress and effect. All of which should go to ensure that the warning lights are sufficient, efficient and reliable for the important job they do of protecting both vehicle and personnel. Some developing countries however, simply accept a flashing light no matter how bright or how effective it is.

Colours of warning lights for the various Emergency Services vary throughout the world with some Fire Services using Red some others Blue, while still others use Blue/Red and yet others Amber. Some also combine in either white or green lights.

There is some logic for each service to have their own individual recognition and a logical approach would seem to be that Police should be Blue – while Fire could be Red and Ambulance could be Green.

However, in some countries a red light shown to the front is illegal as is a white light to the rear although these are laws dating back to the 1920s and a change could be justified at least in relation to red warning lights on Emergency Vehicles and in particular on Fire vehicles.

Around twenty years ago in Australia when the Police changed to combined Blue/Red warning lights the Fire Service also followed suit which may have been a missed opportunity to give them their individual warning identity.

Fire Services in some other countries in Europe use amber which would seem totally impractical with the large amount of amber warning lights used on a variety of vehicles from Road Sweepers to Breakdown-Recovery Vehicles to even vans and tipper trucks.

The coming years will no doubt see even more progression in the capabilities and usage of LED products in helping to provide a safe environment for fire-fighters.

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*Pic courtesy of MFC Survival Ltd*



# Flood Water Rescue

The summer of 2007 saw the UK being affected by what were described as two 'unprecedented' rainfall events. These led to widespread flooding resulting in the UKF&RS's largest rescue operation since the Second World War. In total over 55,000 homes and businesses were flooded and over 9000 rescues undertaken.

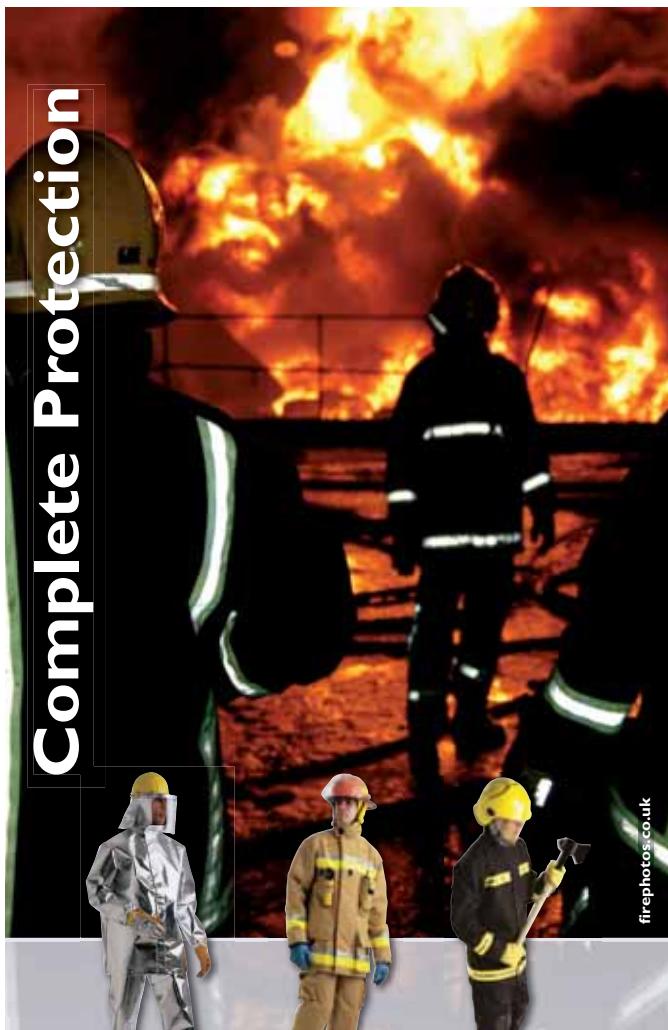
**By Frances Hilton**

**T**hese events drew attention to the key role the UK F&RS play during floods events – one which they currently have no statutory duty to undertake..

After the flooding in August 2007, Sir Michael Pitt was asked by Ministers to conduct an independent review of the flooding emergency that took place. In his interim review of December 2007 Sir Michael concluded that unless otherwise agreed locally, 'upper tier' local authorities should be the lead organisation in relation to multi-agency planning for severe weather emergencies at the local level, and for triggering multi-agency arrangements in response to severe weather warnings. The Pitt review also pointed out that organisations carrying out flood rescue, including the fire and rescue services, the Maritime and Coastguard

Agency, and numerous NGO's, are highly valued by the public and were generally praised for their effective operations over the summer. However, the review notes that there is currently some ambiguity as to which organisations have responsibilities for flood rescue.

The UK Fire and Rescue Services usually attend to such situations, and all fire and rescue crews should have received some basic training to work safely near water. In 2001, a UK Fire Service manual was published entitled "Safe Working Near, On or In Water", which provided general guidance on water rescue operations and for the first time outlined national training levels. Response capability differs between services and whilst some have little specialist water and flood rescue capability others are well equipped with



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Pic courtesy of MFC Survival Ltd

specialist teams of swiftwater and flood rescue technicians and boat operators. In times of flooding there is an expectation from the community that the Fire and Rescue Service will provide a response, yet as already mentioned they have no explicit statutory duties for flood rescue. Similarly, although the Maritime and Coastguard Agency is a Category 1 responder for emergencies at sea, on the coast and in estuaries, and the RNLI has a statutory duty on the Thames, neither organisation has a legal responsibility for flood rescue. However, both organisations played an active role in the response to the summer 2007 floods and deployed crews to assist the local response in a number of the affected areas.

The Summer floods of 2007 were instrumental in showing that there is now a much greater capability within the UK Fire and Rescue Service to respond to major floods as compared to previous



floods in 2000, but at the same time highlighted areas of response that need development. For the first time a Fire Service National Flood Support Centre was set up to coordinate specialist response and this was used to deploy teams of swiftwater rescue technicians and boat operators to the affected areas. It's not practical for an individual Fire and Rescue Services to have the necessary personnel and equipment to deal with a major flood event and the ability to call in specialist rescue teams from outside the area is the key to dealing with these events. In the USA, the concept of 'Team Typing' has been in use for a number of years whereby rescue assets are 'typed' against a pre-determined capability framework. This allows strategic managers to request assistance and know the capability of those who are providing assistance. An ad-hoc version of this 'Team Typing' was set up at short notice last summer by the National

Flood Support Centre and proved to be highly effective.

However whilst it was good to see that specialist teams with appropriate training and equipment were available it was still possible to see frontline fire fighters wading in flood waters in fire fighting clothing to rescue people. If we are expecting firefighters to undertake such rescue we need to provide them with both the correct equipment and training to do so safely. However, the financial implications of providing such training and equipment to all fire fighters is considerable.

The Fire Brigades Union has commented stating that the supply of suitable equipment to fire fighters should be an integral part of proper planning for future flood emergencies.

The lessons of the floods 2007 ought to lead to better equipment for frontline firefighters dealing with floods. The Pitt Review states that a key issue to be considered is the provision of



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*Pic courtesy of MFC Survival Ltd*



resources needed specifically to undertake flood rescue, including personal protective equipment, pumps, rescue craft and especially, trained personnel.

As yet the Fire and Rescue Service as a whole does not have a statutory duty to deal with floods nor adequate training or equipment. Paul Hayden, Chief Fire Officer for Hereford and Worcester, said a lack of standard training and equipment meant the Fire and Rescue Service's response to flooding "isn't as effective as we otherwise could be" and called for improved coordination.

In a study entitled Project Aquarius undertaken on behalf of the former Office of the Deputy Prime Minister it was found that in the UK Fire and Rescue Services were using 15 different types of vessel for water rescue. Often these were designed for recreation rather than workboat use. Water rescue craft need to be stable, durable, light-

weight and rapidly deployable. A low freeboard permitting easy boarding and a high degree of buoyancy is also desirable as is already available from specialist companies such as MFC Survival Ltd. As well as rescue craft other essential equipment for flood water rescue includes dry-suits, life jackets, buoyancy aids and throw lines etc. Having the right equipment for flood rescue is essential but it means nothing without the proper training.

New draft training levels are currently at the final consultation stage and the draft document includes training in both Swiftwater and Flood Rescue Boat Operations and Management of Water and Flood Incidents. Training in these two areas have already been available from training providers such as Rescue 3 (UK) but their adoption as national standards will help solve the issues of co-ordination of response capability as highlighted by Chief Hayden.

With UK's weather predicted to change and flooding set to increase it is clear that 2007's 'unprecedented' event may well be tomorrow's foreseeable response challenges for the UK Fire and Rescue Service and that to meet these investment in training and equipment is essential. However whilst the community expects the fire service to respond to such events it will be difficult for them to finance the necessary training and equipment without a statutory duty and the central funding associated with such a duty. **IFF**

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*Pic courtesy of Hytrans Fire Systems*



# Statoil Prepares for the Worst

During a potential catastrophic incident in May 2007, Statoil, together with a leading pump supplier, demonstrates how to successfully combine resources. IFF talks with Karsten Eliasen, Fire Chief at the Statoil Kalundborg Refinery in Denmark and Robert Hut, Managing Director Hytrans Fire Systems, the Netherlands.

**With Karsten Eliasen and Robert Hut**

**W**ednesday July 11th 2007 started as an ordinary day at the Statoil Kalundborg Refinery in Denmark, until at 14:15 in the afternoon they discovered that the floating roof of one of their 70 meter Crude Oil tank was not floating anymore. Due to at that time unknown reasons, the floating roof had tilted allowing crude oil to accumulate on top of the roof. At this time the tank was still holding 33 million liters of crude oil, a potential recipe for disaster.

**Fire Chief Karsten Eliasen:** "although the weather conditions were such that we could not expect thunder and lightning conditions, the crude oil accumulation on top of the floating roof presented a real risk of a full surface crude oil fire if ignited. Our tanks are all fitted with the latest foam applications tools, and although these are very effective to battle a rim seal fire, they are not capable to tackle a full surface crude oil fire. We knew we were in it for a long while and the longer

it would take the bigger the chance of a fire being ignited". Normally, the Kalundborg Refinery has 115,000kg of 3% AFFF foam in stock, several large capacities 7000 lpm monitors and an alarm team of 3 fire fighters. To battle a full scale fire, the refinery can count on 15 on site fire fighters. The local fire brigade can provide an additional 20 fire fighters within 10 minutes and another 25 within 30 minutes.

Quick calculations showed that to fight a full surface fire a minimum of 38,000 lpm water and foam mixture was needed. The fixed water supply system for these tanks could only provide half of this, so an alternative solution had to be found, and rather quickly as well. This alternative had to come from the closest open source of water; the sea. However, for the worst case scenario, the route over which the water had to be transported was a staggering 4km away, while the best case scenario was still over 800m distance between the sea and the tank. They needed a flexible quickly

*Pic courtesy of Hytrans Fire Systems*



to operate system which could accomplish this monstrous task.

**Fire Chief Karsten Eliasen:** "We knew about a company from Holland who provided the pumps and hoses to the UK government during the large tank farm fire in Hemel Hempstead near London in December 2005. We had also previously witnessed a demonstration from Hytrans Fire System, a Fire Pump manufacturer from Holland. Few months ago they had invited some Statoil fire fighters to see the HydroSub High Volume Pumping System in action during one of their demonstration tours in Denmark and Sweden. These HydroSub pumps and their hose system made an overwhelming impression on us and thus we resorted to contact Hytrans for their Assistance".

As a result, the **Hytrans Managing Director, Mr. Robert Hut**, was contacted with the request to dispatch a pumping system to provide 20,000 lpm of seawater over a maximum distance

of 4000m, and to provide a big gun to put the water onto the fire, if it would come to a full surface fire.

**Robert Hut, MD, Hytrans Fire System:** "I received the call from Statoil late Wednesday afternoon. Although we are not a 24hr emergency response organization, we will of course always help within our possibilities. After the situation was explained we quickly made a pressure calculation based on the capacities and distances required by the situation in Kalundborg. The conclusion was that for the worst case scenario (22,000 lpm over 4000m) we needed to bring a HydroSub 900 pumping unit (22,000 lpm @ 12 bar), 4000m of 12 in. rubber hose and a boost

**After the situation was explained  
we quickly made a pressure  
calculation based on the  
capacities and distances required  
by the situation in Kalundborg.**

pump with deck gun to increase the pressure at the end of the hose to actually put it onto the fire. Normally this is not equipment we carry in stock, so we had to be resourceful and contact our partners and customers to complete the system to be able to help. As luck would have it, we had just completed a HydroSub 900 pump for a customer in Japan. After quick consultation with this customer the green light was given to use this unit for an actual emergency situation. The HydroSub 900 was put on transport from our facility that same Wednesday evening. We then contacted our valued customer the NAM (part of SHELL) who already have a large Hytrans Water Transport



*Pic courtesy of Hytrans Fire Systems*

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*Pic courtesy of Hytrans  
Fire Systems*



System. The NAM was willing to dispatch a driver with a truck and trailer with two of their Hose Layer Containers, each containing 2000m 12 in. rubber hose and a hose recovery unit. The NAM driver left early Thursday morning to arrive late Thursday.

The last item we needed was a big boost pump with a deck gun and foam adding capability, which our sister company **Holland Special Pumps** in Rotterdam could provide. Not having this equipment ready, in typical Holland Special Pumps fashion ('special is our middle name') they worked frantically to put this together on Thursday morning, to have it ready and tested to leave their facility late Thursday morning. In fact, it was their **Owner and Managing Director Henk**

**de Wit**, who decided to personally bring the unit to Statoil in Denmark."

Finally, Robert Hut drove to Denmark with some additional 12 in. Y-pieces, gate valve and non return valve, should these be needed.

During the course of Thursday all major items were present at the refinery. Although the situation with the floating roof was stable and the tank was being prepared to be pump empty, it was decided to set up the system anyway, not waiting for a fire to start first.

**Fire Chief Karsten Eliasen**: "We know the Hytrans System can be set up in under an hour with only a few persons, so even if a fire was to start, we could still have the system operational quick enough to successfully fight the fire.



*Pic courtesy of Hytrans  
Fire Systems*



*Pic courtesy of Hytrans  
Fire Systems*

However, since everything was present we decided to proceed with the set up anyway."

The decision was made to set up the water supply over the shortest possible route, still covering over 800m of distance between the seawater intake and tank. A single line of 12 in. hose was deployed, the HydroSub 900 was placed at the water intake, the submersible feeder pumps pushed into the water and the booster pump with deck gun was placed strategically at the tank. A quick test confirmed everything was in full working order and the system was put on standby mode.

**Fire Chief Karsten Eliasen continues** "This whole incident has proved how valuable it is to have good contacts in the industry. This incident required the willingness and capability of two industrial Fire Brigades from two different nationalities and two equipment suppliers to work together as a single team during a crisis. Thankfully the crisis did not erupt and little attention has been given to this incident in the media. Imagine the negative publicity for Statoil and the industry in general this would have generated if we would not have been able to fight the fire! How-

**This incident required the willingness and capability of  
two industrial Fire Brigades from two different nationalities  
and two equipment suppliers to work together as a single  
team during a crisis.**

**Fire Chief Karsten Eliasen:** "Now that the system was on standby, all efforts could be directed towards salvaging the crude oil from the tank and securing the floating roof, during this period no major problems were encountered. This whole operation lasted until Saturday July 14th and once the situation allowed we stood down the Hytrans personnel, on which they started to recover the hose and pumps to prepare for their return to Holland. Amazingly, they managed to recover the 800m of 12 in. hose with the three of them in less than 2 hours".

ever, if we had a full surface fire, I am confident we would have been able to extinguish this fire within minutes".

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**By Dr Clifford Jones**

I was asked by the Editor to provide a piece on the recent mishap at Heathrow and this I am pleased to do. I thought it preferable however to set the Heathrow incident within a discussion of aircraft fires more widely and am happy that the Editor agreed to this.



# Aircraft Fires

The vulnerability of aircraft to fire is of course very largely due to the large quantities of flammable liquid which carried as fuel. Fuel tanks are vented to the atmosphere so that the space above the liquid surface is occupied by a fuel vapour/air mixture at the pressure corresponding to the altitude.

## Aircraft fuel tanks

Jet fuels for aircraft, which are of course in the kerosene boiling range in the distillation of crude oil, tend to have vapour pressures such that, at a total pressure of 1 bar, below 38°C the vapour-air mixture in the tank is too lean to ignite. Above 80°C the mixture is too rich to ignite. At cruising altitude the total pressure will of course be well below 1 bar.

At cruising height fire in the tanks is precluded by the factors outlined above, but not necessarily during take-off and landing. It is in fact understood that for a small proportion of its time in the air a jet aircraft will have in its tanks an ignitable vapour-air mixture. This was stated in the follow-up to a fire involving a TWA 747 aircraft taking off from JFK Airport in New York in 1996. Many US aircraft were lost during the Vietnam War through explosion of the fuel tank due to enemy ground fire, and means of inerting the tanks were developed using nitrogen (carried in liquid form) or carbon dioxide (carried as dry ice) as inerting substances. The situation with commercial aircraft is that since the 1996 TWA crash the FAA are starting to require inerting by some means or other. Some US airlines are at the present time

struggling for financial survival, and a positive injunction to retrofit aircraft with inerting devices could cause such airlines to become non-viable.

## Selected aircraft fires

The table on pages 42 and 43 gives details of some aircraft fires from over the decades.

Comments on from the table complementary to those made before it are as follows. First, as well as the fuel the hydraulic fluid constitutes a major fire hazard. Secondly, possible electrical sources of ignition are abundant. A typical wide body passenger aircraft has of the order of 90 miles of wiring.

## The Heathrow incident in 2008

The was no fire or explosion as a result of this accident, but points relevant to fuel hazards did feature follow-up and one important lesson was learnt. Fuel did in fact leak from the crashed plane, but without igniting. Spar valves, closure of which stops fuel supply to the engines in the event of an emergency, were fitted to the aircraft. When the crashed 777 was examined both of these were found to be in the open position and this was the reason for the fuel leakage which, in the event, had no consequences, but which if the spar valves had fulfilled

the purpose for which they were installed would not have occurred. The Aircraft Accident Investigation Board's Bulletin made the following points. Electrical power for spar valve closure is provided when the fire handle, which initiates release of extinguishant (held in 'fire bottles') in the engine areas, is engaged. Such power is also provided when the fuel control switches are placed in the 'cut-off' position. With the 777 as manufactured, when both fuel control switch and fire handle are operated it needs to be in that order – fuel control switch first and fire handle second – for the highest reliability of the spar valve closure. For a reason clearly identifiable when the circuitry is reviewed, this reliability is lower if the two operations are reversed. Accordingly, Boeing had issued a service bulletin recommending a simple circuit modification such that the dependence of the reliability of spar valve closure on sequential operation was eliminated, and the FAA requires that to be implemented in all 777s in service

Date and location	Aircraft type
Bryce Canyon UT, 1947	DC6
Durrenach, Switzerland, 1963	Caravelle
Blossburg PA, 1967	BAC 1-11
Heathrow, 1968	Boeing 707
JFK Airport NY, 1975	DC10
Sioux City IA, 1989	DC10
Hartsfield International Airport, 1995	DC9
Bangkok, 2001	Boeing 737
Vancouver, 2002	Airbus A330
Dallas/FW, 2004	Boeing 757
Afghanistan 2006	RAF Nimrod
Okinawa Japan, 2007	Boeing 737
Yogyakarta Indonesia, 2007	Boeing 737



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**Circumstances**

The DC 6 was equipped to transfer fuel between tanks during flight in order to make the weight distribution even, and in such an operation vapour had leaked and had been ignited by heating elements in the cabin's own heating system. The fuel being used was in the gasoline boiling range, as the DC 6 used piston engines. The aircraft crashed and all 52 persons on board were killed.

Tyre burst on taking off, the pressure effects of which caused a fuel line to break. Fire resulted and the aircraft crashed killing all 80 occupants.

Air drawn into the aircraft misdirected, enabling it to contact fuel vapour and form an ignitable mixture. The fire so created spread to hydraulic fluid, also flammable, and the aircraft crashed with the loss of 34 lives.

Engine (one of four) caught fire and dropped off. The aircraft returned to the airport and by the time it was stationary there several parts of it were on fire and emergency chutes had to be used to evacuate passengers and crew and passengers. 5 deaths.

Several birds drawn into one engine during take-off. The pilot returned to ground, and the aircraft ran off the runway and was destroyed by fire which had begun in the affected engine and was exacerbated by overheated brakes. The death toll was 138.

Aircraft having taken off from Denver Airport the lost its hydraulic functions and attempted a diversion to Sioux City Gateway Airport. The aircraft crashed on its approach to Sioux City Gateway Airport with a resulting fireball and the loss of 111 lives.

State-of-the-art Aircraft Rescue and Fire Fighting Atlanta GA, (ARFF) vehicles in use at the airport reached the aircraft less than one minute after the alarm was raised and had the fire totally extinguished within 15 minutes.

Aircraft on the ground with air conditioning in operation and the centre fuel tank empty. In a 737, heat removed from the cabin by the air conditioning is taken to a heat exchanger close to the centre fuel tank. In a so-called empty tank there is residual vapour which can be affected by amounts of heat of the order of that at the heat exchanger, especially if the fuel pump is turned on as it was in the incident under discussion. The fire, which claimed two lives, is therefore believed to have been caused by heat transfer from heat exchanger to vapour and provision of an ignition source by the pump.

Aircraft stationary at the time of the fire, with no passengers on board. Wiring in the in-flight entertainment system is believed to have been the origin of the fire. A fan assembly from within the entertainment system was found on examination to have become detached. Other evidence of considerable heat generation was melted solder.

Very minor fire due to overheating of the windshield heater. A similar incident with a Boeing 757 at Copenhagen. No consequences whatsoever in either case. A terminal block in the heater circuit redesigned by Boeing.

The Nimrod had just been refuelled in flight from an RAF Tristar, taking on just under 10 tonne of fuel over a 6 minute period. Fuel having been received in a tank on one wing was being transferred to a tank on the other. It is possible that the fuel being so transferred came close to pipes bearing hot ( $\approx 400^\circ\text{C}$ ) exit gas from one of the engines. Another possibility is simply leakage of fuel during the mid-air refuelling.

The aircraft, operated by a Taiwanese airline, was destroyed by the fire although all on board escaped unhurt. A bolt from the wing pierced a fuel line and this was the cause of the fire.

Explosion on landing, death toll 22. It is believed that the front wheel of the aircraft was on fire before the landing.

in the US by July 2010. It had not been implemented in the 777 which crashed at Heathrow, the evacuation checklist for which recommended that the captain should operate the fuel control switches and the first officer the fire handle. Such independent operation tends to preclude sequencing. Boeing have issued a safety recommendation that the need for sequential operation be noted on evacuation checklists in 777s not yet having implemented the modification recommended in the service bulletin issued before the Heathrow accident. **IFF**

**Note**

This article has drawn on 'A Source Book of Fire Engineering' by J.C. Jones, currently in press with Whittles Publishing who have given permission for use of the material in this article. Details of 'A Source Book of Fire Engineering' will appear in this periodical later in 2008.



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# Leakage and ignition of flammable liquids



By Dr Clifford Jones

The term 'flammable liquid' is of course an extremely broad one. It takes in the numerous liquid derivatives of crude oil, those intended for use as fuels and those processed for other uses, e.g., transformer oil, hydraulic fluids. The term also takes in oxygenated substances such as ethanol, which is gaining increasing importance as the world moves towards carbon-neutral fuels, and plant oils which can form the basis of biodiesels.

## Flash points\*

### Background

A reader is referred elsewhere (e.g.<sup>1</sup>) for a full discussion of flash points, their measurement and interpretation. That the flash points in the literature for many simple organic compounds are significantly in error is not in doubt,<sup>1</sup> and caution is required in the use of a 'literature value' of the flash point of a liquid compound. Nevertheless, flash points remain central to the assessment of storage and transportation of flammable liquids and have, for a century or more, featured in legislation appertaining to flammable liquids. A measured flash point might be required to stand up in law and is only likely to do so if the measurement has been according to a procedure approved by one of the standards body, e.g., ISO<sup>t</sup>, ASTM<sup>f</sup>. A court of law is expected to hand down judgements and, where these relate to an issue not previously considered by a court, such a judgement can become a precedent and therefore in a sense constitute a new law. The author has occasionally exercised his mind (and those of his students) with the hypothetical case which is set out in the shaded area below.

### *A hypothetical case involving dimethyl ether*

Dimethyl ether is a dangerously flammable flammable substance having, for example, been the cause of an accident at a chemical plant in Germany in the 1940s which led to 207 deaths and over 500 serious injuries. Imagine that there had been a recent industrial explosion involving dimethyl ether and that the case came to court. The plant owners/operators might argue in their defence that they had noted the flash point of dimethyl ether and developed their practices

accordingly. The value of the flash point of dimethyl ether which they had used was -41°C. The present author obtained that value from Wikipedia<sup>3</sup> on 19th April 2008 and he had, over several years previously, seen that value in many authoritative sources including the Society of Fire Protection Engineers (SFPE) Handbook and the CRC Handbook of Physics and Chemistry. However, this value has been proven to be in error on the dangerous (low) side by about 40° in 2001, as reported in:

Jones J.C. 'Uncertainties in the flash point of dimethyl ether' *Journal of Loss Prevention in the Process Industries* 14 429-430 (2001)

The true flash point is in fact about -83°C. Returning to our hypothetical court case, the plant owners/operators might assert that they had obtained a 'current value' of the flash point and that the fact that that was in error did not constitute negligence on their part. The court would then be likely to hand down one of the following judgements:

- That the plant owners/operators were justified in relying on the accepted value of the flash point incorrect though it was.
- That the plant owners/operators had a duty to keep themselves abreast of recent developments and ought to have known about the article which shows the widely accepted flash point of dimethyl ether to be grossly in error.

It is a few years now since the paper on the flash point of dimethyl ether referred to was published. Had our hypothetical case been only a year or two after its publication the court might have made the first of the two judgements above, whereas in 2008 it might have made the second. Even so, the corrected value of the flash point is only starting to enter compilations of flash points, such is the inertia in such matters even in these days of electronic dissemination of information.

\*This section continues and significantly extends part of an earlier contribution to IFF by the present author.<sup>2</sup>

<sup>t</sup>The name of this body is simply the Greek word ISO. The term is NOT an acronym for 'International Standards Organisation'.  
<sup>f</sup>American Society for Testing and Materials.

**Recent transformer oil fires include that at Lithgow, New South Wales in January 2008. About 200 litres of transformer oil are believed to have leaked. The transformer was new and had only recently been installed. In the same month there was a transformer oil fire at Port Allen Louisiana and one at Beaverton Oregon. The latter resulted in a fireball.**

### Some particular flammable liquids

#### Preamble

Previous articles in this periodical have dealt with fires in hydrocarbon fuels<sup>2,4</sup> and with an explosion in an oxygenated organic substance.<sup>5</sup> Editors and author entertain a hope that these articles will build up into a significant resource for consultation and accordingly will enlarge their scope by considering two of the types of flammable liquid mentioned in the introduction to this article which had not featured in the previous articles: transformer oil and hydraulic fluids. The concluding comments will, in recognition of their increasing importance, be concerned with biodiesel fuels.

#### Transformer oil

Transformer oil has a cooling and an insulating role, and is usually closely specified distillate from crude oil although some also contain synthetic esters. A distillate transformer oil will be from the higher boiling end of the range and will have a flash point comparable to that of some diesels and well above room temperature. Nevertheless, transformer oil fires are very common and their frequency in the US is approximately one per day. Use of polychloro biphenyls (PCBs) in transformers has declined because of their harmful environmental effects. These are ignitable, but less so than the substances now used as transformer oils.

Recent transformer oil fires include that at Lithgow, New South Wales in January 2008. About 200 litres of transformer oil are believed to have leaked. The transformer was new and had only recently been installed. In the same month there was a transformer oil fire at Port Allen Louisiana and one at Beaverton Oregon. The latter resulted in a fireball.

#### Hydraulic fluids

Performance criteria for hydraulic fluids relate largely to viscosity. Fire hazards with such fluids are assessed by means of their flash points. Hydraulic fluids are made from diverse sources, often from crude oil. Most major oil companies offer hydraulic fluids for sale. A single example amongst very many is the Nuto H series of hydraulic oils produced by Exxon Mobil. They are of designation H 10, H 15, H 22 and H 32 where the number is the kinematic viscosity at 40°C in centistokes. The respective flash points are 170, 182, 206 and 212°C. There are also vegetable based hydraulic fluids, having for example soybean oil or rapeseed oil as base stock.

Hydraulic systems in aircraft contribute to the fire hazard of air travel and there have been hydraulic fluid fires in aircraft with fatal consequences. One of the best known was the loss in 1987 of a B-1B bomber aircraft over Colorado. This experienced leakage of both fuel and of hydraulic fluid because of impact with a bird of the species *Pelecanus erythrorhynchos*, an adult example of which can weigh 10 kg. Only three of the six crew managed to eject to safety. At places including the USAF Wright Laboratory there has been activity in the production of totally non-flammable hydraulic fluids for aircraft, which use chlorotrifluoroethylene (CTFE) as base stock. There

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have also been a number of patent applications appertaining to such fluids.

Moving from hydraulic fluid fires in aircraft to those on the ground, Hamlet North Carolina was the scene in 1991 of a fire at a chicken processing plant in which 25 workers died and 49 more were injured. The fire began when hydraulic oil leaked and was ignited by a fryer. Employees were unable to escape because the exits had been locked. Criminal charges resulted and the owner of the plant received a long custodial sentence. Amongst the most recent incidents involving fire hazards with hydraulic fluids are the following two, one in

fire at a biodiesel plant Bakersfield California in 2006. This in fact drew the attention of the fire community to an important point: where biodiesel is being processed there is almost certain to be methanol present, as it is used as a reagent to process raw vegetable oil to give it the required cetane index. It is believed that the Bakersville fire began when methanol ignited as a result of static electricity. So vegetable oil fire hazards and methanol fire hazards co-exist in biodiesel processing, and this is one of many of the issues that will need to be noted and acted upon as the use of biodiesel fuels becomes more prevalent. **IFF**

## **Hydraulic systems in aircraft contribute to the fire hazard of air travel and there have been hydraulic fluid fires in aircraft with fatal consequences. One of the best known was the loss in 1987 of a B-1B bomber aircraft over Colorado. This experienced leakage of both fuel and of hydraulic fluid because of impact with a bird of the species Pelecanus erythrorhynchos, an adult example of which can weigh 10 kg.**

the US and one in Europe. At Mission Hills California in 2007 there was an overturning of a truck/crane combination on a freeway. The Los Angeles Fire Department attended the scene and their priority was to contain leaked hydraulic fluid and prevent it from igniting. The overturned vehicle contained 500 gallons of such fluid. Earlier that year, hydraulic fluid in a lift was the origin of a fire in a home for the elderly in Liege, Belgium.

### **Concluding remarks apropos of biodiesel fuels**

Vegetable oils are becoming increasingly widely used and members of the fire protection profession can expect that expansion of the biodiesel industry will be accompanied by close observation of fire hazards and the development and implementation of 'best practices'. This article will conclude with yet another case study, that of the

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### **Note**

This article has drawn on 'A Source Book of Fire Engineering' by J.C. Jones, currently in press with Whittles Publishing who have given permission for use of the material in this article. Details of 'A Source Book of Fire Engineering' will appear in this periodical later in 2008.

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# Hose Reels – A First Defence Against Industrial Fires

The desirability of having fixed hose reels in buildings – particularly industrial premises – and their use as a first response to a fire was given a boost in the UK with the enactment of the Regulatory Reform (Fire Safety) Order. Here John Allen, EMEA Marketing Director for Tyco Fire Suppression and Building Products, takes a close look at the role they can play in improving fire safety in the industrial workplace.

**By John Allen**

EMEA Marketing Director, Tyco Fire Suppression and Building Products

The one common theme that comes out of any discussion on the use of fixed hose reels is a genuine concern to improve the standard of fire safety for industrial site occupants, visitors to buildings and firefighting professionals. So, at first glance, there would appear to be little scope for questioning the advisability of fitting fixed hose reels; water is very effective for fighting the majority of fires, and prompt action may well stop a minor outbreak from developing into a major life or property-threatening incident.

While the increased dependence on fixed sprinkler systems and the widespread adoption of portable extinguishers has reduced the use of hose reels in many commercial properties, they still have an undeniable role in industrial buildings – factories, warehouses and distribution centres.

But, think of an industrial building, and what springs to mind? Probably, one of those massive, modern, high-tech structures you see alongside every highway. But this image is not really a true reflection of the world's stock of industrial buildings. Even in economically advanced countries, many are often smaller, much older premises, frequently located in tightly-compact industrial sites and sometimes cheek-by-jowl to densely populated residential areas.

The construction of many industrial buildings pre-dates current building codes and standards. This means that we have an unspecified number of factories around the world that can be characterised as being built to lower construction standards than those prevailing today, and that incorporate building materials that are no longer



acceptable, such as asbestos, cladding and lining materials with unacceptable spread of flame or other adverse fire performance characteristics. They are built to passive and active fire safety standards, in terms of the overall degree of fire protection, compartmentalisation, fire stopping, fire detection and fire suppressions that would be unacceptable in industrial buildings built today, they are now being used for purposes other than those originally intended, and contain substantially different fire loadings than was originally taken into account.

That being said, industrial fires are, thankfully, relatively uncommon. However, when they do occur, they can develop quickly into major life and property threatening incidents, so effective first response action can make a significant difference to the outcome.

So why are there so many conflicting views, when the fitting and use of hose reels is so widely adopted in many European countries that have an equally acute concern for fire safety? In Europe, for example, the use of hose reels is, almost without exception, on the increase due to the greater understanding of the need to have trained personnel.

Part of the problem is undoubtedly the absence of reliable information to support some of the concerns. While studies have been conducted into the use of hose reels by building occupants, these have been rather small-scale, localised research projects that may well not be representative of a national picture. The challenge is that, in all probability, a significant proportion of fires extinguished by building occupants – whether by using portable extinguishers or hoses – are not reported as fires and so do not form part of any national fire statistics. Hence, it is impossible to say how many lives have been saved and how much damage has been avoided.

However, it is surely arguable that there must be cases where prompt action by employees trained in fire safety has resulted in a major outbreak being avoided. On the other hand, it is hard to recall a single incident in recent years where a trained employee has been injured as a

result of inappropriate use of a hose. It is a company's responsibility though to ensure that personnel are trained – and regularly re-trained – in general fire safety procedures and the safe and appropriate use of fire fighting equipment, including hoses.

So let us look at some of the more commonly held opinions about the use of hose reels. First the contention that fire brigades are, in general, opposed to them. Certainly, it appears that currently most brigades do not use fixed hose reels installed in buildings, and advise building occupants to evacuate the building and leave fighting the fire to the fire brigade. This seems to be sound advice until you take into account that things are, in the UK at least, very different in today's fire service.

Following the Fire and Rescue Act in 2004, every UK fire brigade has devised an Integrated Risk Management Plan that endeavours to balance its obligations with its resources. This has resulted, in some parts of the UK, in brigades not responding to an alarm unless there is "visual confirmation" of a fire. Other brigades will, in the first instance, send a four-wheel-drive vehicle to assess the fire before committing further resources, while some will not permit firefighters to enter an unfamiliar building to tackle a blaze unless there is reason to believe that people are inside the building.

So, considering the brigades' view that evacuation is the best policy, this means that the entire responsibility for fighting a fire rests with the fire brigade. In the case of a large or complex industrial building, for example, the time taken to deploy the brigade's own equipment may well take so long that a minor blaze, which could have been fought by trained employees or by the brigade using the building's fixed equipment, takes hold. So the arguments in favour of a fixed hose reel installation, providing it is properly sited and regularly maintained, seem compelling.

Concern is sometimes expressed that, while a portable extinguisher is quickly emptied, the continuous supply of water for a hose may well result in the user fighting a blaze for longer than is safe. There is also the risk of the employee leaving fire doors open as the hose is trailed through the building, so increasing the risk of the blaze spreading. Once again though, this comes down to the imperative need for users to be trained, not just in the use of the equipment, but also in fire safety generally.

Therefore, there are grounds for arguing that fixed hose reels have an important contribution to make to industrial fire safety, providing employees are properly trained, and providing the equipment is effectively sited, that it is of an appropriate standard and is well maintained. However, the message for organisations that either have fixed hose reel installation, or are considering installing one, is clear – get professional advice. Ensure that the equipment is appropriate to the building and the fire risk, and that it meets the local fire brigade's requirements if that brigade's policy is to utilise fixed equipment if it is available. Next, make sure that there are an adequate number of trained employees. This training needs to embrace fire safety training generally and, specifically, the use of fixed hose reels. Finally, make sure that the installation is regularly tested and professionally maintained.

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# ARFF Preparation for the Larger Aircraft – Airbus A380



**By Khalid Ismail  
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tests with Airbus technical personnel to ensure that the airport modifications and enhancements being developed for the A380 aircraft adequately meet its needs.

This includes modifying Gate F 13 the first phase and later an explicit terminal to accommodate A 380 operations, the airport taxiways and runways that have also been modified to meet international safety requirements for the new large aircraft.

Emirates Airlines the state owned Airlines has ordered 40+ A380 aircrafts at the initial phase, and some more in pipeline, are eagerly waiting for the delivery with complete preparation of its first aircraft. ARFF crew have made conscious efforts to conduct regular familiarization visits to the aircraft when on many occasions the Aircrafts were brought in to participate in Dubai Air-shows.

These interactions had given ARFF Crew the opportunities to carry out compatibility trials of our new equipment on the aircraft. In addition, crew took the opportunities to familiarize themselves with the operational aspects of the aircraft, such as the opening of cargo compartment doors and emergency exits. More importantly, they could see for themselves the challenges posed by the size and different layouts of the aircraft.

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### Driving and Fire Fighting Simulator

This was first developed and commissioned into our training curriculum in 2005. The Simulator is an interactive software programme allowing our ARFF crew to virtually walk through the various types of safety aspects of and simulation of driving safety and extinguishment process during a real fire of aircraft operating in Dubai International Airport and in the process, enhancing their operational knowledge of the aircraft (e.g. fire fighting components, escape routes, cut-in points, emergency exits)

### Aircraft Rescue & Fire fighting simulator

With the knowledge of Fire Simulator, ARFF crew now possesses a realistic platform which they can access at their own time, on top of the planned training routine.

The simulator that we possess is simulating Boeing 777. Considering the future requirement (Dubai Airport has two major Airports working under one umbrella) we have avoided to upgrade the existing one (simulator) rather we are in the process of building a newer model which can simulate A380 in our way. It may be into being at any time from now.

Keeping in view that nothing is better than practical training from time to time, the Aircraft Rescue and Fire fighting Simulator at the Fire-ground (within the Airport proximity) are made

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available as a new training facility, Fire fighting crew are and will be able to come face to face with the challenges of aircraft rescue and Fire fighting involving an A380. ARFF crew, are from time to time, required to participate in a 'hot-fire' drill once every three months as a part of their individual training roadmap. Each 'hot fire' drill is designed to replicate a possible aircraft emergency scenario such as engine fire, undercarriage incident, cargo compartment fire and Aircraft Ground incident. With the A380 mock-up, fire fighters are required to execute the drills as per unit tactical plans to deal with an A380 emergency, with 'injects' thrown in during the course of mitigation. The 'hot-fire' drills not only serve to refresh the operational proficiencies of the crew but also test their decision making skills.

#### **High reach extension turret (HRET)**

HRET is a vehicle mounted assisting equipment to reach the upper deck of Airbus A380 should the situation demand. We have 2 of the same, all in preparation of receiving A380. Although it is not an obligatory demand as per the ICAO prescribed rules, yet, this is an added facility brought well in advance.

#### **Emergency Air stairs**

Dubai Airport ARFF has always strived to make available realistic training facilities for all in order to keep updated. We are in the process of acquiring equipments like Emergency Air Stairs. These are to facilitate the ARFF crew for encountering incidents mainly at the A380's upper deck, which is conservatively estimated to house about 200 passengers. With a higher passenger density on its upper deck, one of the challenges facing rescuers and passengers is the efficient passenger evacuation from the aircraft. The Emergency Airstairs should allow rescuers to gain quick access to the upper passenger deck of the aircraft, ensuring the swift evacuation of passengers from the upper deck. The unit is expected to be added to our facilities any time sooner rather than later.

#### **Thermal Image Camera family**



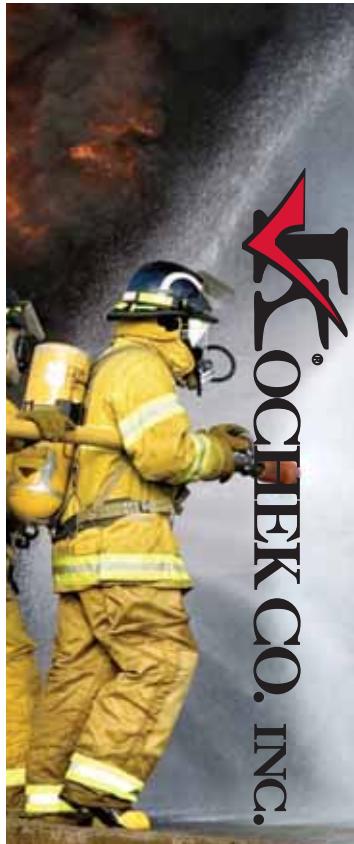
These highly safety oriented cameras are installed in each of the Fire tenders that helps the crew to locate the point of incidence very comfortably no matter what the visibility is e.g cat-II, cat-III or during higher density of fog. The camera safely projects any object at a length of 800 meters thus ARFF crew are able to locate any place of incidence during any unforeseen situation reducing the response time. Over and above we have the ARFF domestic Fire Tenders equipped with portable Thermal Image camera.

#### **Ongoing Challenges**

Regardless of how effective our training is, how well-equipped are we, and how well prepared our crew are to encounter A380 incident, overall crisis management will never be successful without the support from our mutual aid agencies under the Airport Emergency Plan (AEP) framework. We conduct full-scale crash exercises twice a year, which involves the physical deployment of around 400 personnel from our mutual aid agencies. These exercises facilitate the cross-pollination of ideas and help improve synergy amongst participating agencies.

The Dubai Airport Emergency plan had been updated to tighten the collaborative crisis management framework. The capacity of facilities for Next-of-Kin, Private Matching Area (for reconciliation of survivors) and Casualty Clearance Station (for initial triaging of injured) have also been re-sized considering the enhancement of passengers flow which have quadrupled very recently. Resources from supporting agencies are augmented to cope with the increased demands of their work.

As we understand the vastness of these possibilities, the challenge is to come up with non-conventional exercise protocols to test the various cells without affecting airport operations



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# UNIFIRE



and causing 'exercise fatigue' within the participating agencies. With this in mind, we have plans to organize partial exercises to inject a greater sense of realism into an A380 accident scenario. This will allow us to harness all resources and channel them into various aspects of the overall crisis management framework for more in-depth testing of individual work cells.

We will also continue to refine our unit tactical plans to take into account customized configurations of the A380 operated by different airlines, to better prepare Fire fighting in rescue missions.

From time to time we are and will continuously devise better ways to uplift its operational readiness and stand ever ready to mitigate emergencies involving the New Larger Aeroplanes. **IFF**

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# Complexity/ Regularity Paradigm in Rescue

Rescuers around the world are daily faced with different types of rescue situations. The frequency of these different rescues types has a lot to do with the risks present in a given geographical area of responsibility. As an example, a rescue department close to a major motorway may well have to deal with a large number of high-speed crashes. Whereas a rescue team located in an industrial area may be more familiar with industrial type accidents commonly found in light industry.

**By Brendon Morris**

Technical Rescue  
Consultation and  
Training Manager,  
Holmatro Rescue  
Equipment

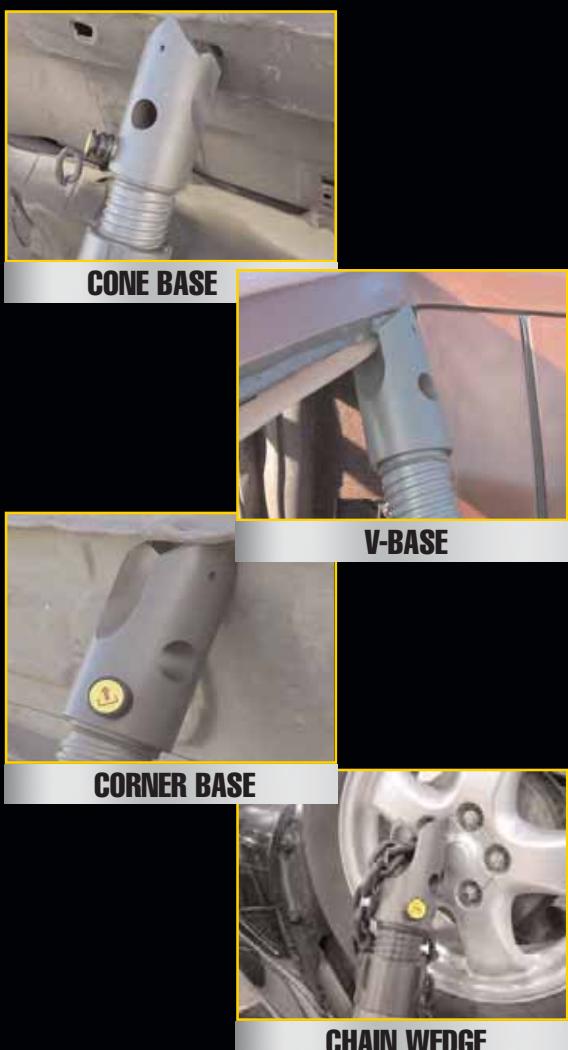
Deep investigation into the different types of rescue situations faced by a "typical" rescue department shows an interesting relation between the regularity and complexity of the different rescue types seen. In most cases there is an inverse relation between the complexity and regularity of different rescue situations (figure 1). In other words, the more common a rescue type is, the less complex it usually is. Inversely, the less common a rescue situation is the more complex it normally is.

Let us for instance make a comparison between two different extrication rescue situations. On one side of the paradigm we will use a light motor vehicle extrication. Extrication of persons trapped

in regular passenger cars is in many instances the most common rescue discipline performed by the "typical" rescue teams. At the same time this discipline is not generally considered as a very complex affair. On the other side of the paradigm we could see collapsed structure rescue, commonly referred to as Urban Search and Rescue (USAR). Building collapse is in most cases not often encountered by the average rescue team. In terms of complexity we also know that in comparison to light vehicle extrication, USAR is usually considered to be more complex.

The most pronounced implication of the relation between complexity and regularity is its affect on rescue ability. Rescue activities in the high

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regularity/low complexity realm (low on the curve) usually represent disciplines where a higher level of ability among rescuers exist. This is not complex to understand, as these are the types of rescues frequently dealt with by rescuers and generally not that complex to deal with. The problem arises with the rescue types that can be found in the high complexity/low regularity area of our paradigm (high on the curve). These rescue activities present the rescuer with difficult and complex situations with the added disadvantage that those involved will not usually have been exposed to similar events in the recent past (or perhaps ever).

The result is that rescue teams find themselves very competent in dealing with the majority of the rescue events they have responsibility for, but that they are, at the same time, not very well prepared for those incidents classified high on the complexity/regularity curve. So what are some of the actions that can be taken to counteract the weaknesses highlighted by this paradigm? In most cases countermeasures to these weaknesses can best be found under the headings of training, staffing and equipment.

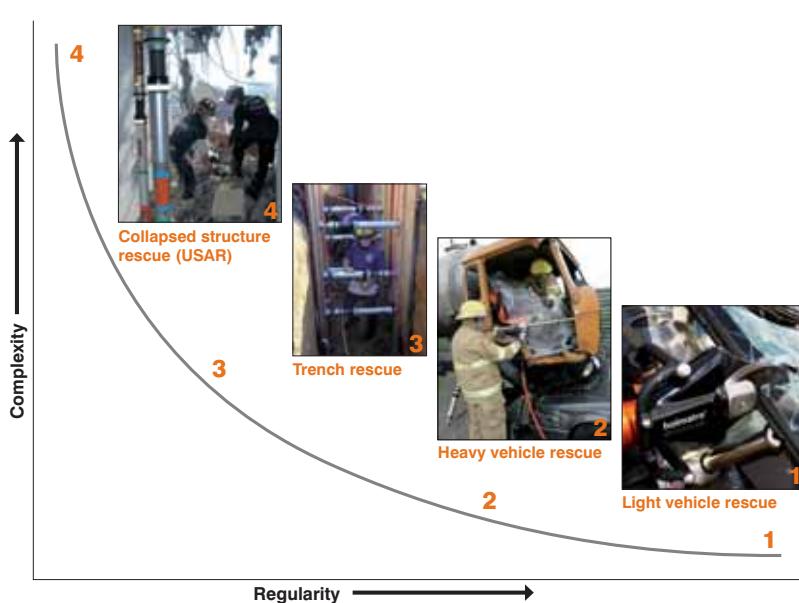
Training, as in so many cases holds many of the answers. The first question to consider is whether or not rescue teams should focus their training on the rescue disciplines in the high complexity/low regularity categories (high on the curve) or on those in the as low complexity/high regularity area (low on the curve). This may seem easy to answer, with the need for high-quality training in more complex/less regularly seen rescue situations appearing quite logical. The proper training focus however, must consider how teams are staffed. In other words, if one has a specialized team responsible for high complexity/low regularity type incidents, then the need for training time on these topics may be different compared to the training needs of other teams. On the flipside however, a "one team" type approach (often seen in smaller rescue services), where rescuers are expected to be able to perform a variety of different technical disciplines, calls for the need to invest in training in the high complexity/low regularity disciplines to ensure success. At the same time the need to invest in honing skills used in the more "everyday" type of rescues may be highly desirable too.

Equipment choice also has a dramatic influence on the training and staffing needs when considering the regularity/complexity paradigm. In most cases the best bet for rescue teams is to choose equipment that can be applied across this paradigm. In this case teams do not have to deal with unfamiliar rescue tools only used in the more complex/less regular incidents. By selecting equipment that can be deployed in different forms across the complexity/regularity paradigm, one provides for better familiarity with it. This can be very valuable when the equipment needs to be used under the stressful conditions of a highly complex incident.

Much fumbling and confusion can be avoided through a wise choice of equipment that can be well applied across this paradigm. Consider for instance a well designed emergency shoring system. Such a system will be able to be used in a variety of emergency shoring applications across the complexity/regularity paradigm. It can be utilized in as simple a situation as a light motor

vehicle on its side through to the stabilization of collapsed structures. These kinds of systems make good sense when considering the rescue requirements attached to such a wide diversity of situations.

In some cases, rescue teams choose simple stabilization systems whose application possibilities are limited to simple high regularity light vehicle rescues. The problem with this approach is that rescuers become very familiar with these systems (in itself not an issue), but when faced with a more complex/less regular event then suddenly have to use more advanced systems they have not much experience with. It may seem a little over the top to use a shoring system with a hydraulic lifting capacity to simply stabilize a car on its roof. However, when this same system can be used to stabilize and, where necessary, lift a heavy goods vehicle in a car under-run situation, it suddenly makes a lot more sense.



**Figure 1.** The relation between the complexity and regularity of different types of rescue situations

**Brendon Morris** has been the Technical Rescue Consultation and Training Manager at Holmatro Rescue Equipment, based in the Netherlands, since 2001. Before this he worked in the emergency services of South Africa and, as a lecturer, at the Durban University of Technology, Department of Emergency Medical Care and Rescue.

Brendon is actively involved in the provision of consultation and training to emergency service departments around the world. In the last years he has consulted to no less than 40 different countries' emergency services in the field.

In conclusion, we see that the effect of high complexity/low regularity type incidents cannot be ignored. This is especially true when considering the training, staffing and equipment considerations surrounding them. Simply focusing on the low complexity/high regularity (low on the curve) type events may well provide short term gains, but eventually will lead to decreased efficiency and effectiveness of the "typical" rescue team. **IFF**



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# A Moment of Reflection

## Positive Pressure Ventilation/Attack – Where are we today?

Think back to ventilation in the early '80s. Ladders always on the roof, holes cut, and smoke ejectors were placed downwind in doors and windows. We strode over to the pumper, found our power supply adapters, reeled out the power cords and set up the smoke ejectors after we had knocked down the fire and were performing salvage and overhaul operations.

**By Lori Peace, M.A.**

Program Coordinator,  
Municipal Recruit Fire  
Academy, Texas A&M

**T**hen positive pressure ventilation (PPV) was introduced. We marveled at the fans, they moved a lot of air. We liked the fact that we no longer had to manage power cords but we used them in a similar manner as our smoke ejectors, post knockdown, during salvage and overhaul operations and after venting the roof. At that time the concept of using PPV as a method of fire attack was ridiculous. Later, it became interesting and controversial. But now PPV is used to support PPA, Positive Pressure Attack, which is an accepted method of fire attack. But, amazingly, many fire departments have not embraced this

idea that will make fire attack safer, cooler, and enhance the potential survival of victims.

In teaching the next generation of firefighters, we must acknowledge that a great deal of research has been funded in an effort to adequately evaluate the effectiveness and appropriate application of the PPA. Everything from room fires to high rise fires has been evaluated and yield similar results. But, like the use of any strategy, we must emphasize the cautionary points involved with evaluating selecting a method of fire attack.

Cadets are eager to learn how to apply water and foam, so it strikes them odd that air may be

*Pic courtesy of Super Vacuum Manufacturing Co. Inc.*



an option that is a more practical and very effective means of fire attack. The advantages can be pointed out in class, and then applied during live fire training operations. While analyzing how the positive pressure attack actually works, it ties together some of the material that is addressed in the beginning of their fire training academy regarding fire science. Early on, we teach about fire spread, smoke and heat. When cadets realize that this can be controlled in certain circumstances by something as simple as a big fan, it does take a little of the thunder out of the fire training. As trainees come to understand that we must manipulate the items that are problematic (heat, smoke, etc.) they realize that the blowers force out the heat, smoke and other hazardous gases, thus enhancing the survivability of any victims, and clearing the way for advancement of the attack line. The environment is cooler to work in, visibility is improved, and deployment is quicker and more effective than traditional ventilation. If PPA is a viable option, it leads to a safer operation, especially when you consider the workloads and the environment to which firefighters are exposed.

In considering fire attack options, we again review a subject studied previously in the academy, pre-plans. Occupancy knowledge is mandatory when selecting an attack method. Hazardous contents and unique hazards need to be known prior to employing any type of action. By having a good working knowledge of the structure, building construction, and potential exhaust locations fire

crews can speed up the scene survey, and this leads to even quicker set up of the PPA.

In scenarios, it is important to stress to trainees that a coordinated fire attack is essential. During a real response, command often gauges success or failure choices from what has been experienced previously, whether in training or in reality. Cadets do not have that advantage, so it is important to demonstrate both the successful implementation of PPA and the consequences that will occur if all of the necessary responsibilities are not performed or if one neglects to collect information necessary for selecting PPA as the attack method.

But as cadets matriculate through the fire academy, their skills sharpen and assessment time speeds up, therefore confirmation of all criteria necessary to select PPA is quicker as well. Using the same training structure during multiple burns, cadets become familiar with the structure and begin to formulate strategies for attack. The advantages of PPA are many and the results speak volumes. By changing up scenarios, rooms involved, exposures, and the roles of the cadets, training continues to be challenging. Cadets can consider a variety of attack options and settle on the best option.

As instructional staff assists the trainee assigned as incident commander, a visible struggle occurs. A struggle to quickly sort information and select a strategy that addresses the safe rescue of victims, accounts for lightweight modern construction, and also accounts for the increased heat

production inside modern structures. The fire scene must be monitored continuously, both inside and out. The fire location must be known, building type and features must be identified and an adequate exhaust opening must be selected. If this does not occur, then instructional staff must alter the scenario to reflect the negative consequences that this choice will produce. But when an appropriate exhaust location is selected, exhaust will be directed away from exposures and will be large enough to accommodate for the fire load.

One of the values of teaching PPA to cadets is that a training environment one can clearly illustrate the consequences of selecting an insufficient exhaust opening and the problems that occur because of the excessive noise the fan generates. As the cadet playing the role of commander watches these problems unfold, problem-solving abilities are tested. With practice, most are able to recognize the problem and the instructional staff watches learning occur as the cadet makes choices to correct any missteps.

Interior conditions must be known and must be monitored continuously. Accountability systems are tested and cadet commanders should be swiftly reminded if there is any question about the location of firefighters. Implementing PPA without knowing the location of fire crews could be deadly.

In training, we know where most of the mistakes will happen. We make sure that a selected exhaust location is cleared of personnel before the blower is started and we assure that there are no

firefighters between the fire and the exhaust opening. Other cautions, such as working in a flammable atmosphere or a backdraft condition can be stressed in the classroom environment, but are not able to be practically applied during live fire situations. If we do present a scenario where these conditions exist, trainees must acknowledge that PPA is not a viable attack choice for that particular fire.

Throughout the scenarios, the trainees must practice scene surveys, locating the fire, and locating a safe and effective vent location on the exterior. While utilizing various scenarios involving fire load, trainees should be quizzes about the size of the exhaust portal to see if the correct choice can be made – for light loads, 2-3 times the size of the ventilation point and for heavier loads, increase the size of the exhaust to 3-4 times the size of the ventilation point. This should allow for adequate removal of the products of combustion.

One good practice is to assign students as one would a regular fire response company. Practicing with a company concept assists trainees in understanding the various roles and responsibilities that may be practically applied when working a real fire. The company officer should perform the size up and select and open an appropriate exhaust opening location when selecting positive pressure attack. The Firefighter I pulls the hoseline and extends it to the ventilation point where the company will enter. The Driver/Engineer will operate the pump and have the blower fan operational and ready for positioning. After a thorough size

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up, personnel accountability, and creation of an exhaust opening, the blower can be placed and started, which causes pressurization. The heat and smoke are directed and vented, and the attack line enters the structure with the wind at their back. Visibility is greatly improved, victims can be quickly located, the fire quickly located and extinguished, and fire crews experience a fire attack that has used little water, yielded quick results, and has saved their exposure to a great deal of heat and low visibility environments. Practicing this type of attack while training and in a controlled situation strengthens the experience of trainees and provides them with the confidence needed to safely utilize PPA.

When teaching PPA or any other attack method, it is prudent to stress the fact that any tactic utilized on the fireground must be selected by detailed information, adequate training, and assuring the correct circumstances to implement that tactic. Just like selecting a tool, one has to be able to choose which one is right for the job. One strong point about PPA – if at any time this option is no longer appropriate, just stop the fan.

We are afforded the opportunity to utilize various methods of fire attack because we are operating more safely than in the past. Advancements with personnel accountability, fire scene organization, building construction, and modern training methods have yielded remarkable results

in the success of fire operations. With these, we are able to employ tactics that generate substantial results without a great deal of effort. Work smart, not hard is the idea here. Technology assists us with a better size up, a more effective rescue and knockdown all the while easing the workload on fire suppression personnel. We can all hope that the improvements mean a safer operation for everyone involved – from victims to firefighters.

Think about the advancements that are commonplace in today's fire service. In addition to PPV, thermal imagers and CAF Systems have made profound statements in the way we understand and manage fire operations. Acknowledging the success of new methods and technologies is often difficult because it takes us away from our normal operations, out of our comfort zone. PPA began by taking firefighters and command staff out of their comfort zones. Now, with training, it is clear that safely choosing to execute PPA is one of those ideas that fits well into modern firefighting operations, so long as command follows all of the rules of engagement.

As we turn over command to the up and coming officers in our departments, we are seeing that they have known no other way to attack a fire except to use the advantages that exist today. With regular technological advances in safety equipment, tools, and cooling methods, I am eager to see the future of firefighting unfold. **IFF**

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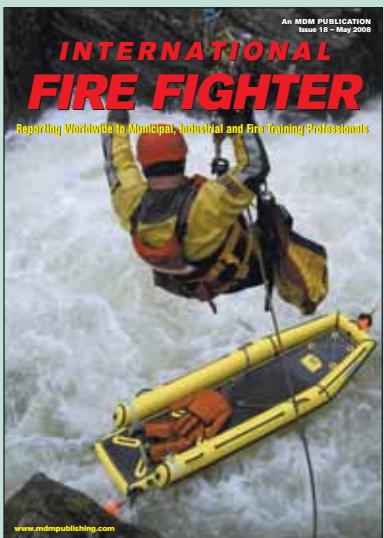
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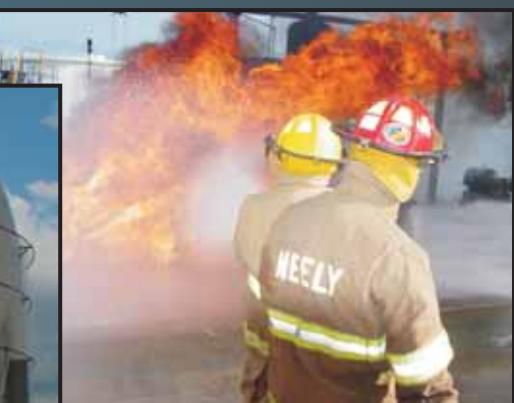
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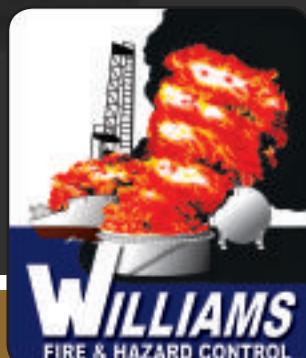
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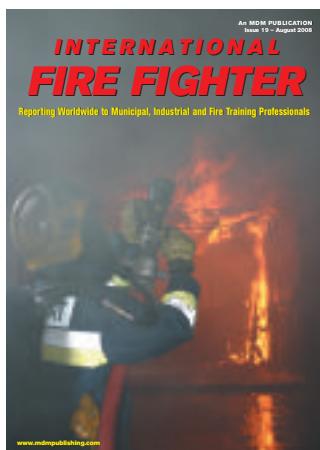
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**Issue 19**



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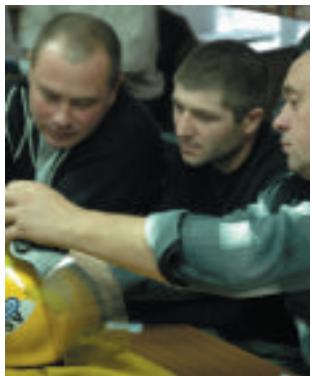
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- Live Demonstrations
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If you are involved with fire, fire health & safety or fire prevention as part of your job, if you are looking for the latest technology, products and developments, then FDIC Middle East is a must attend event.

For further information or to register visit [www.fdicmiddleeast.com](http://www.fdicmiddleeast.com)

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Well prepared for any situation and NFPA 1981 and 1982, 2007 approved:

# The Draeger PSS 7000

The new Draeger PSS 7000 self-contained breathing apparatus (SCBA) has received NFPA 1981 and 1982, 2007 approvals. The device is approved to meet and exceed NFPA's new standard for water submersion, tumble test, heat and cold testing. It achieves the highest requirements in the market.

The Draeger PSS 7000 offers diverse features for successful fire fighting.

## **The monitoring system – Sentinel**

The Draeger PSS 7000 features a smart fully integrated electronic fire fighter monitoring system. The electronic monitoring system called Sentinel 7000, which is approved to the 1982, 2007 standard, includes a PASS device providing both audible and visual alarms to the fire fighter. It displays and records all vital information from the PASS device as well as from the SCBA providing real time information regarding air supply and consumption.

## **New communication system including the TST**

The new communication system fits into the Draeger FPS 7000 mask which sets new industry standards for face fit and comfort. It comes in three distinctive sizes to perfectly fit the contour of the face and provides excellent sealing between the mask and face. It also has a fully integrated voice amplifier and radio interface system. The twin speakers provide exceptional voice clarity with a surround sound output. The Draeger FPS communication system has an extremely low profile as it was designed and built to fit into the actual face mask. For the first time Draeger introduces the TST technology to the industry (Titanium Sound Technology). This new technology which has a resistance to high temperature environments is incorporated into the Draeger PASS alarm sounders providing a loud 95 dba plus warning output to alert other fire fighters in the area.

## **Tailor made solutions for fire fighters**

The flexible carrying system with integrated handles, internal hose guides, and a patented swivel waist belt optimizes the overall weight and balance providing a lower center of gravity than traditional SCBAs, setting a new standard for freedom of movement. A large number of firefighters throughout North America were surveyed to ensure every aspect of this SCBA was covered and designed to meet the requirements. The Draeger PSS 7000 uses the latest technology and materials, to ensure long and enduring reliability. This means that the



Draeger PSS 7000 is a dependable partner, even under extreme conditions. The innovative features like "on demand" Heads-Up Display system provide firefighters the ability to see air pressure levels in the environment no matter how thick the smoke.

## **New Designs and Materials**

Draeger's new harness suspension system uses vocalized rubber outer layer covering a

closed cell inner core. This new structure provides excellent harness stability and wear resistance to the fire fighters when wearing the SCBA. It ensures that the apparatus fits perfectly to the torso of the fire fighter. All hoses are integrated into the back plate protecting them from snagging and the environment. The newly designed backplate made of carbon composite material is designed to meet the tough conditions of the fire industry. Large handles on the backplate enable the firefighter to hold on to a team member or drag them to safety. The fully adjustable backplate design offers the most freedom of movement and best fit of any SCBA. The Draeger PSS 7000 is ergonomically designed, easy to use, decontaminate, and maintain. The Draeger PSS 7000 has been designed to expand with future telemetry and additional communications systems to be introduced by Draeger in the near future.

## **For more information contact:**

Shelli Cosmides  
Tel: 412 788-5671  
Email: shelli.cosmides@draeger.com

# **New from Holmatro: Special Materials Cutter SMC 4006**

## **For hard materials such as chains, padlocks and re-bar**

Holmatro Rescue Equipment now introduces the SMC 4006: a specialized cutter for hard solid materials such as chains, padlocks and re-bar. These are materials regular rescue cutters cannot cut, at least not without risking serious blade damage. The blade and jaw design of the SMC 4006, however, specifically lends itself to cutting materials far exceeding the EN 13204 norm in terms of hardness.

Thanks to its compact low weight design and adjustable rotating carrying handle Holmatro's Special Materials Cutter is suitable for use in difficult to reach areas and confined spaces. It is available for both traditional dual hose and single hose CORE™ systems and can be operated by using any double-acting pump in the Holmatro range.

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*Cutting a chain that locks a gate with Holmatro's SMC 4006*

# SABIC Innovative Plastics Chooses Lion Apparel For Industrial Firefighting Protection Needs

The SABIC Innovative Plastics Fire Department has chosen Lion Apparel's V-Force protective coats and pants with Nomex® antistatic outer shell and Pudots® combined moisture barrier and thermal liner for its personal protective equipment (PPE) needs.

The product meets the everyday needs for use in an industrial firefighting environment in the chemical industry.

"Lion had practical solutions for several problems we had encountered, such as bottoms of trousers being worn out by sagging, exposure at the throat due to poor tab design. There were also innovative features we had not even considered before, such as ergonomic design of the reinforcement patches," said SABIC Innovative Plastics Fire Chief Jeremy Barber. "The no-questions-asked provision of a test suit also confirmed that the turnout gear felt right and was comfortable, and practical, in use."

The new turnout gear enhances the department's comfort and protection with increased mobility, durability, chemical repellency and washing resistance. Special



features such as perforated reflective trim provide optimum breathability.

"This order was very special for us, since it was our first business in the Netherlands. The people at SABIC Fire Department are very knowledgeable about PPE. We had excellent discussions and question-and-answer sessions with SABIC when it came to recommending the right gear for their applications," said Timo Czech, managing director for Lion Apparel Deutschland. "After receiving the order, we went to the Netherlands for

fittings and ensured all the labeling was in Dutch."

"The quality of the product, the prompt and flexible service and the right price made us go for Lion," Barber said. "We're very satisfied at the comfort and ease of donning."

"Seeing a happy customer is a great reward for this team effort," Czech said.

SABIC Innovative Plastics is a world leader in providing engineering thermoplastic material solutions and has operations in more than 60 countries worldwide.

To learn more, visit [www.lionapparel.com](http://www.lionapparel.com) or [www.lionapparel.de](http://www.lionapparel.de)

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## Contract Award – Simulation win Contract in Saudi Arabia

SIMULATION, based in Staffordshire, UK ([www.simulation.uk.com](http://www.simulation.uk.com)) have recently been awarded a contract to provide a Maritime Fire Training Unit to the Faculty of Marine Science, King Abdul Aziz University in Jeddah. "We are pleased to announce that we have been selected by the university in Jeddah to deliver this Maritime Fire Training Unit. This marks another milestone in the achievements of our company as traditionally we have a very strong position in the aviation sector with the supply of state of the art aircraft fire training simulators, as we are now providing university establishments in the middle east region." Work has already commenced on the construction phase of the project and completion and handover of the facility is planned for December 2008. The maritime fire training units consists of a range of internal compartments of a ship and the unit is multi-level. There are a total of 7 internal lpg fires. These fire scenarios will be Deck 1 – Engine Fire, Split Flange Fire, Fuel Spill and on Deck 2 there will be a Bed



Fire, Cooker Fire, Cooker Spill and Ceiling Rollover Fire. All fires scenarios will be LPG. There will be a fixed fighting system with outlet points on both Deck levels. There will be full PLC computer controlled safety and fire control management system including electronic ignition, gas monitoring, temperature monitoring, mechanical extraction, data logging and alarms. Steve Fahey, Managing Director continues "This project will be the first we have supplied to a university in the Middle East and it is anticipated that many more opportunities for product development and supply will follow in the months and years ahead in this region."

For more information visit our website [www.simulation.uk.com](http://www.simulation.uk.com)

# Draeger introduces Bodyguard 7000

## – the latest edition to its complete system solution for professional firefighters

Developed by Draeger as part of a modular, complete system solution for professional firefighters, the new Draeger Bodyguard 7000 Electronic Monitoring Unit is designed for use with the innovative Draeger PSS 7000 Self-Contained Breathing Apparatus (SCBA).

**B**oasting advanced technology as well as an ergonomic design, this sophisticated electronic signal and warning unit provides continuous monitoring of the operational status of both the firefighter and the BA. Improving firefighter safety as well as comfort and performance, it can also be used in conjunction with other modular items from Draeger such as the new FPS 7000 Head-Up Display and HPS 6200 Helmet.

The revolutionary design of the Draeger Bodyguard 7000 not only ensures a balanced distribution of weight by incorporating the pressure sensor and power supply modules into the backplate of the BA, but it also means that the electronic gauge can be compact as well as light-weight at approx 300g.

Utilising simple, user-friendly push button controls to provide fast access to essential information, the gauge incorporates a highly visible LCD display that provides accurate and continuously updated data in an easy to read format. This includes time-to-whistle, which is calculated on current air consumption, digital pressure reading in bar, and a simulated analogue gauge. With integral ADSU and Distress signals, it also performs automatic self tests and system tests and emits both visual and acoustic alarms. For maximum flexibility, it is also offered with a choice of operating modes: Tally and Automatic.

In addition to larger information icons, text information such as user id and text alerts can be scrolled, whilst good visibility is assured, even in poor lighting conditions, by the use of new enhanced backlights and red and blue warning LEDs.

Located in the backplate, the power supply module can be easily and quickly replaced in the field and is available as an AA battery pack which provides operating duration of more than 365 hours during normal use.

Of particular benefit is the fact that each Draeger Bodyguard 7000 can now be programmed to identify the user and/or the Brigade automatically. Prior to use, the user simply uploads his or her personal ID, wirelessly, using a personalised pre-programmed ID card. Parameter settings and datalogging can also be performed easily via a



wireless link to the new Draeger PSS 7000 PC Link module and to the PC via a standard USB connection. Draeger PSS 7000 PC software can also be used to tailor the unit to individual requirements or to download and analyse datalogs as and when required.

Draeger Safety manufactures a wide range of respiratory protective equipment as well as personal escape sets, chemical protection suits and both portable and fixed gas detection systems. **IFF**

Bodyguard, PSS and HPS are registered trademarks.

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# CompAir service schedule for Breathing Air Compressors

During installation, inspections, maintenance, or repairs a lock-out procedure must be followed:

1. Announce the lock-out to other personnel.
2. Turn power off at main box.
3. Lock power box in the off position.
4. Put key in your pocket.
5. Document lock out and reasons for the lock out in the daily log book.
6. Make sure unit is clear of all personnel.
7. Test lock-out by trying to start the unit.
8. Complete required operations.
9. Announce that the lock-out condition is being ended and clear the unit of all personnel.
10. Take key out of your pocket.
11. Unlock the power box.
12. Turn the power box on.
13. Announce that the unit has power to other personnel.
14. Document that lockout has been lifted and any actions taken in the daily log book.

All units are installed with MAKO Break-in Oil. The unit must be run for 50 hours with this type of Break-in oil. This type of oil must be changed every 3 months.

#### **Lock Out Procedure:**

Before carrying out any maintenance work be sure that all pressure is released and the machine is electrically isolated. Never attempt to straighten badly bent tubing or re-use damaged fittings. Tampering with safety valves invalidates the warranty.

On CE units the pressure setting of each pressure relief valve can be found on the tag attached to the relief valve. Regular servicing is essential to maintaining compressor design performance.

Maintenance intervals will depend on operating conditions. The following intervals can be used as a guide when the machine is operated under normal conditions.

#### **Weekly Maintenance**

Operate compressor continuously for a period of not less than one hour allowing for at least four condensate drain cycles. This will remove any moisture build up in the system and provide proper lubrication.

Units which are not run continuously for a minimum of 1 hour once a week require additional precautions to be taken by qualified service personnel.

Check function of Pressure Maintaining Valve:

1. With compressor off slowly and carefully open the system outlet valve or a fill hose valve to release pressure from system outlet.
2. Turn on compressor.
3. Air should not come out of system outlet until purification system pressure reaches a minimum of 1900 psi. (131 bar)
4. If pressure fails to reach 1900 psi. (131 bar) shut down unit until problem is corrected.



Check stage pressures to determine if they are within stated limits. Abnormal stage pressures can be a sign of a serious problem shut down the unit. do not restart compressor until problem has been resolved.

Inspect all nuts, screws and fittings for tightness. Inspect for oil or air leaks. Leaks must be rectified immediately. Inspect air intake filter and clean or replace

#### **After First 50 Hours Running Time**

Check belt alignment and tension. Adjust if necessary.

Check tightness of all nuts and bolts.

Drain crankcase of break-in oil and refill with genuine MAKO synthetic oil.

Change oil filter and O-ring.(for 4 stage compressors)

#### **Every 500 Hours Running Time (or 6 Months)**

Check alignment and belt tension.

#### **Every 1000 Hours Running Time**

Change piston rings on final stage plunger.

Clean external surfaces of all coolers, especially the first stage unit and finned area of final delivery cooler. Use a soft brush and low pressure air. Do not use gasoline, diesel fuel, or other toxic substances. Ensure fan blades are clean.

Final separator chamber must be removed, disassembled, cleaned, inspected and hydrostatically tested.

Remove and service all suction and delivery valves.

#### **Every 1500 Hours Running Time**

Refurbish or replace all valves.

#### **Every 2000 Hours Running Time**

Fit new final stage plunger and liner.

Remove and service all suction and delivery valves.

#### **Every 3000 Hours Running Time**

Conduct a full mechanical check.

Check pressure gauges for correct reading.

Replace all valves.

Hydrostatically test intercooler and after-cooler to minimize risk of tube failure during operation.

Remove and service all suction and delivery valves.

For more information contact,

CompAir UK Ltd

Reavell House

53-56 White House Road

Ipswich, Suffolk IP1 5PB, UK

Tel: +44 (0) 745451

Website: [www.compair.com](http://www.compair.com)

## Simulation International Ltd

are specialist on specialists in the design, manufacture, commissioning and installation of live fire training simulators.

Due to an increase in the demand from both UK and Overseas we are seeking to employ suitably qualified persons to fulfil the following positions within our company:

**1 Senior Design Engineer**

**2 Technical (Combustion) Engineer**

**3 Project Engineer and**

**4 AutoCad Design Draughtsperson**



**Simulation**

Experience with the industry would be preferred but this is not essential.  
Please apply by email and submit cv to [mh@simulation.uk.com](mailto:mh@simulation.uk.com)

**[www.simulation.uk.com](http://www.simulation.uk.com)**

# Sperian Respiratory Protection France - market leader

Sperian Respiratory Protection France, part of Sperian Protection Group, inherits more than a century of safety expertise and innovation culture. Now we are one of the breathing apparatus business leaders on the market, manufacturing disposable half-masks, escape breathing apparatus using chemical Oxygen, as long duration SCBA.

**W**orking in close collaboration with Fire brigades, Civil Defences, Armies and Industry professionals has allowed us to put at your disposal performing reliable and latest advanced technology apparatus.

Fruit of many years of research, Fenzy X-Pro is a unique concept gathering the latest innovations for unfailing comfort and reliability in toughest conditions. It has been designed and developed by professionals for professionals to offer Firemen a Self Contained Breathing Apparatus meeting all their requirements.

Materials which compose the Fenzy X-Pro combine comfort and high performance. Resistant to hostile environments such as extreme temperatures or chemical ejections, they guarantee unrivalled endurance and lifetime.

With its new "Extreme Comfort" harness concept, Fenzy X-Pro passed the flame engulfment test as per EN 137: 2006 standard.

Its ultra light back plate includes the Easydo system allowing adjusting it vertically in 2 positions and an articulated waist belt to follow all the hip movement of the wearer.

As regards the cylinder innovative systems, the Fenzy quick-fix permits to replace them quickly and easily. The foldable and movable foot of the back plate protects the HP system.

Comfort is reinforced by the Fenzy Opti-Pro mask with full panoramic vision without optical distortion and by the Fenzy SX-Pro new first breath demand valve.

Safety is optimized by new dedicated technologies: the Fenzy Angel II multifunction monitoring device and the Telemetry system.

Made of two parts, the Fenzy Angel II has a unique design separating the system and the display. The weight of the display unit fixed on the strap has been reduced to a minimum, but the functions are numerous:

Automatic start when cylinders are opened, Digital pressure gauge, remaining duration, automatic distress signal unit, 2 different alarms electronic and whistle, automatic self-test, temperature sensor, optional tally key, black box and radio link.

Operating between -30°C to +70°C, the Fenzy Angel II has a unique feature: In case the display



becomes ineffective, the parameters and alarms are kept in the main unit. All alarms will continue to work.

## Telemetry system Fenzy Angel II

Keep an eye on Firemen remotely, using a data broadcast: Transmitter relay stations are available so that the signal is never lost between the Fenzy Angel II monitoring devices and the monitoring station, even on areas where signal spreading is much more difficult (car parks, confined spaces). With a computer or a PC tablet, equipped with the Fenzy Angel II telemetry software, you are informed in real time of these situations of your brigades entered in action for a maximum safety: Temperature, Duration, Remaining pressure, Alarms. . . .

In case of danger, it is possible to activate an individual or common recall signal from outside.

**For more information contact:**  
**Sperian Respiratory Protection France**  
Z.I. Paris Nord II –  
Immeuble Edison  
33 rue des Vanesses –  
BP55288 Villepinte  
95958 Roissy CDG Cedex –  
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Tel: +33 (0)1 49 90 79 79 –  
Fax: +33 (0)1 49 90 71 49  
Email: [fenzy-info@sperianprotection.com](mailto:fenzy-info@sperianprotection.com)  
Website:  
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# SICURTECH EXPO

## (25th-28th November, fieramilano)

will receive patronage from the ESF (European Safety Federation) and will provide professional opportunities for accident-prevention personnel

Notable patrons, training opportunities, specialist seminars: there are many interesting reasons to attend SICURTECH Expo 2008, the international exhibition which is scheduled to take place from 25th to 28th November, and is dedicated to fire-fighting, health and safety at work and to Civil Defence. The show will be held at the new Fieramilano centre, in Lombardy, a region that has recently approved a plan to reduce by 15% the number of accident victims by the year 2010, backed up with a significant 35 million Euros investment. Therefore, this is the ideal context in which to hold an exhibition dedicated to safety, a situation that is further accentuated by the fact that Milan is the city of choice for EXPO 2015.

SICURTECH Expo 2008 has obtained patronage from ESF (the European Safety Federation), which will hold its AGM on the occasion of the exhibition. ESF is also one of the organisers of the first International Conference on Personal Protection Equipment which is scheduled to take place in Bruges from 21st to 23rd May.

Apart from ESF, further backing for SICURTECH Expo 2008 has been received from



*Fiera Milano per l'EXPO 2015*

ISPESL – The National Institute for Health and Safety at Work, the Italian focal point of the European Agency for Health and Safety at work (OSHA) information network and Federchimica, The Italian federation of chemical industries, which will also organise two seminars within

the context of the exhibition.

SICURTECH Expo will be an important professional opportunity for all accident-prevention sector personnel.

Indeed, as well as offering an exhibition area, SICURTECH Expo will be hosting training workshops with demonstration events dedicated to the use of personal protection equipment. For this year, the workshops will also focus on the importance of behavioural science in the reduction of accidents at work, also known as BBS (Behaviour Based Safety).

In this way, the show will respond to the growing demand for updates by sector personnel. Interesting cultural opportunities will also be provided by the seminar programme which is characterised by a number of seminars promoted in collaboration with the major representatives from associations, industry, institutions and the world of academia. A new and important feature for this year will be the opportunity for personnel participating in some of these events to benefit from training credits.

SICURTECH Expo is organised by Fiera Milano Tech and promoted by ANIMA, the Federation of the Italian Associations of Mechanical and Engineering Industries, which is particularly active in the areas of safety at work. ANIMA's involvement is also due to the participation from federated associations such as ASSOSIC (The Italian Association of Personal Protection Equipment Manufacturers and Distributors), CIADI (Noise Reduction Material and Equipment Manufacturers' Union), and UMAN (Fire-fighting Equipment Manufacturers' Union). Furthermore, the exhibition takes place in collaboration with AIAS (The Italian Association of Safety Professionals). The show will be held in conjunction with SICUREZZA, the international exhibition dedicated to security.



better access and guide rollers ensure that hose retracts smoothly.

For additional information visit Reelcraft at [www.reelcraft.com](http://www.reelcraft.com) or call 1-800-444-3134.

## Reelcraft Offers New Dual Agent Hose Reel

REELCRAFT INDUSTRIES ([www.reelcraft.com](http://www.reelcraft.com)) now offers Series 9300 dual agent hose reels, used primarily in firefighting applications. These reels are designed to be mounted inside truck cabinets and swing out for easy access and operation. These reels come with a 3-way guide roller as standard to protect expensive twin hoses. Reels feature a corrosion resistant powder coat finish and lock pin to prevent de-reeling while truck is in motion. Heavy gauge steel stampings with re-enforced ribs give added structural strength.  $\frac{1}{2}$ " pitch chain is standard to reduce likelihood of chain stretching and jumping off the sprocket. Also, auxiliary bevel rewind offers additional rewind alternative. The reel mounts on a pivot to promote

**SICURTECH**  
**EXPO**

# Speedings Ltd

## – Safety System Solutions for the Emergency Services



Please visit our website:  
[www.speedingsltd.co.uk](http://www.speedingsltd.co.uk) for  
 more information or call us  
 to discuss your requirements  
 on +44 (0)191 523 9933

The safety of Rescuer and Casualty has always been of paramount importance to Speedings Ltd when designing and producing products for use in the Emergency Services.

The introduction of the Speedings Kevlar Lined Sharp End Protection and Speedings Steering Wheel Airbag Protection systems demonstrates this with over 80% of the UK's Fire and Rescue Services using these products to protect both themselves and the casualties.

Speedings also produce a range of High Visibility Clothing, which conform fully to the requirements of BSEN471 Class 3(Hi Conspicuity) that has been designed and manufactured specifically for use by the Emergency Services. Having spent time conducting extensive research into the varying roles undertaken by the modern day Emergency Services we identified that there was a need for a range of products and that one product simply couldn't fit all scenarios. These products have been designed and manufactured taking into account the following legal and moral obligations:

- The New Roads and Street Works Act 1991
- Safety at Street Works and Road Works – A Code of Practice
- Code of Practice for the Coordination of Street Works and for Works for Road Purposes and related matters
- Dear Chief Officer Letter 6/2001
- Dear Chief Officer Letter 2/2002

Following extensive research and testing carried out by the Fire Research and Development Group (FRDG) into the Physiological effects of heat on Firefighters, evidence was gathered which identified that a Firefighter wearing protective clothing manufactured from 'non-breathable' materials was at severe risk from heat related conditions due to the inability for the body to release heat and cool down. The report concluded that Personal Protective Clothing should, where possible, be constructed of materials that were able to 'breathe' and release this built up heat.

An incident occurred in May 2000 where a gas pipeline exploded, the Health and Safety Executive (HSE) – Hazardous Installations Directorate conducted an investigation. Part of this investigation looked at whether the build up of static electricity on the high visibility clothing, being worn by the maintenance crews, could have been the ignition source responsible for the explosion and subsequent fire. The report concluded that the cause of the explosion was inconclusive although the build up of static electricity on the high visibility clothing could not be dismissed as the ignition source.

Following this FRDG research and the HSE investigation report Speedings sourced a range of materials that were 'Breathable', 'Anti-static' and



conform to the requirements of BSEN 531 for Flame Retardancy and commenced the production of 'High Visibility' clothing using these materials.

The requirement for Emergency Service personnel to wear High Visibility Clothing at the scene of Road Traffic Collisions (RTC) and other Medical Emergencies was also a consideration that we have factored into the design of our jackets. The presence of blood and other body fluids means that there is a high probability of the Firefighter coming into contact with this and the likelihood of them getting the jacket contaminated is also high. Speedings jackets are designed and certified to be machine washable at 60 degrees Celsius for twenty-five washes.

The range of Speedings 'High Visibility' clothing includes the following products:

- Class 3 RTC Jacket
- Class 3 Long Sleeved Surcoat
- Class 3 Half Sleeved Surcoat
- Class 3 Long Sleeved Surcoats – with Incident Command System Role Identification

In must be borne in mind that a High Visibility Jacket is an essential part of a Firefighters PPE and it should be inspected, with the results recorded, on a regular basis to ensure that it is still 'fit for purpose'. The BSEN471 certification for 'high conspicuity' is only valid if the jacket is clean – failure to maintain the jacket in a clean condition, free from defect will render the certification invalid and will therefore place a huge risk on the organisation/individual wearer.

The Speedings range of High Visibility Clothing are designed and manufactured in the UK by our team of highly skilled machinists. This means that a customer can have a jacket that is 'unique' to them as we are able to produce both bespoke and generic garments – all products come in a range of sizes.

# Tandem extinguishing twice the protection

Total flooding is not appropriate protection for all assets, yet portable extinguishers are effective only if there is someone around to operate them. Now, Tyco has come up with a solution. Steve Walker, UK Sales Manager for TOTAL® portables at Tyco Fire Suppression & Building Products, explains.

**B**usinesses are becoming ever more dependant upon assets that are central to the organisation's ability to perform. Most of the focus goes on protecting IT and telecommunications equipment, for which total flooding gaseous suppression is frequently the ideal solution. However, many companies have specific items of manufacturing or processing equipment that are vital to the smooth running of the operation and without which the business may soon grind to an alarming halt. Often, these are not "enclosed" and so do not lend themselves to total flooding, even if the cost of such an installation could be justified. They may also be remote from the company's main facility and so beyond the protection of the main fire detection and alarm or fire suppression installation.

**The Tandem extinguisher can be used both in the conventional manually-operated manner during normal manned working hours, and as a fixed unattended automatic extinguisher when the facility is unmanned.**

There are also numerous instances, particularly among small and medium sized enterprises, where workshops, offices, temporary portable accommodation, shops and petrol station forecourts need cost-effective around-the-clock protection. Typically applications include waste containers, small storage areas, machine and engine enclosures, production equipment, and heating and air conditioning plant.

Clearly, what these areas need is an independent, versatile, cost-effective yet reliable solution, and the recently introduced TOTAL® brand Tandem multi-purpose fire extinguishers are designed precisely with this aim in mind. The Tandem extinguisher can be used both in the conventional manually-operated manner during normal manned working hours, and as a fixed unattended automatic extinguisher when the facility is unmanned.



Tandem extinguishers are permanent stored pressure models that incorporate a pressure gauge to ensure permanent pressure control. When the valve is opened, the pressure forces the extinguish-

# Extinguishers offer protection

ant out of the extinguisher using Nitrogen as the propellant. They are available with either foam or dry powder suppressant and are suitable for both Class A and Class B fires as set out in BS EN 2:1992 (*Classification of fires*). Class A fires involve freely-burning organic solid materials such as wood, paper, straw, cloth, textiles and other carbonaceous materials, and Class B fires involve flammable liquids or liquefiable solids such as petrol, diesel, solvents, lubricants and spirits. Tandem powder extinguishers are also appropriate for Class C fires involving gases such as butane and propane, but only when they are used as a portable extinguisher.

When a Tandem extinguisher is wall-mounted for automatic operation, a special 68°C sprinkler sensor activates the agent flow and directs it at a specific fire risk to provide around-the-clock protection. When used in this automatic mode, the extinguisher delivers a "one-shot" flow when the sensor is activated and, depending on the height at which the extinguisher is installed, the

The CE-marked Tandem extinguishers were developed at the dedicated TOTAL research and manufacturing facility in Neuruppin in Germany where, unlike many portables now available on market, virtually every stage of the cylinder manufacture is under TOTAL direct control. This includes material selection and sourcing in Europe, the use of the most advanced low-heat plasma welding techniques and equipment, fabrication, assembly and high-performance powder-coating. It also embraces 100% cylinder pressure testing; and agent filling. To provide a complete and reliable quality audit trail each and every Tandem cylinder is uniquely numbered during manufacture.

Each Tandem cylinder has a one-millimetre-thick corrosion-resistant internal powder coating and is electrode-tested to ensure that there are no pin-point flaws in the coating. The quality of this finish can be judged by the fact that there is a complete absence of colour fading that is a common feature of many inferior quality

**Each Tandem cylinder has a one-millimetre-thick corrosion-resistant internal powder coating and is electrode-tested to ensure that there are no pin-point flaws in the coating. The quality of this finish can be judged by the fact that there is a complete absence of colour fading that is a common feature of many inferior quality cylinders.**

protected area can extend to between four and six metres from the extinguisher. When used as a conventional manually-operated portable extinguisher, delivery of the powder or foam agent is trigger-controlled.

All Tandem portables are safe if inadvertently used on electrical equipment up to 1000v at one-metre distance and have anti-freeze protection of to minus 20°C for the powder models and zero °C for the foam extinguisher. The current offering comprises a 9-litre foam extinguisher and two dry powder models – a 6kg unit and a 12kg unit.

They are manufactured under ISO 9001:2000 [*Quality management systems*] and in accordance with the European standard for portable extinguishers is EN 3: 1996, Part 3 and Part 6, and BS EN 3 Part 7: 2004, which replaced the earlier Parts 1, 2, 4 and 5. Part 3 addresses construction, resistance to pressure and mechanical tests, while Part 6 covers conformity and how to achieve certification. The newer Part 7 encompasses characteristics, performance requirements and test methods.

cylinders. Even the Tandem cylinder wall-mounting brackets are designed to ensure that there is no potential for metal-to-metal or metal-to-wall scuffing.

Tandem extinguishers are part of an extensive line-up of TOTAL special-application portables. Other models include powder extinguishers for coal fires; antimagnetic CO<sub>2</sub> portables for hospitals and clinics; specially-formulated water portables for sawdust fires; wet chemical portables for cooking oil and fat fires; purpose-designed foam portable extinguishers for polar liquid fires; and specifically formulated powder portables to fight metal fires. All are guaranteed for five years, providing they are serviced from new in accordance with the appropriate regulatory standards.

They are available in the UK through Express Fire in Manchester and from a country-wide network of approved TOTAL supply partners that are trained to advise, install and maintain the right extinguishers in peak condition.

Further details on TOTAL portable fire extinguishers are available from Express Fire on + (0) 161 688 5050 or, outside of the UK, from Tyco Safety Fire Suppression & Building Products by telephone on +44(0) 161 875 0400, by fax on +44 (0) 161 875 0491, or via email at [tspmarketing.emea@tycoint.com](mailto:tspmarketing.emea@tycoint.com)

# Latest Akron® Nozzles & Monitors available from Tyco

Akron® Brass is currently celebrating 90 years as a manufacturer of high-performance fire fighting and rescue equipment.

**T**oday, the company is renowned worldwide – particularly for its extensive line-up of industry-standard nozzles and monitors – in the municipal, industrial, aviation, defence and wildfire firefighting markets. In the UK, the NFPA [National Fire Protection Association] and Factory Mutual third-party approved range is available exclusively from the Tyco Fire Suppression & Building Products MACRON® brand operation based in Great Yarmouth.

Many of the company's most popular nozzles and monitors will be centre-stage at the Fire & Rescue exhibition that is taking place this month in Liverpool, England. This will include Akron's recently redesigned Turbojet™ and Assault™ nozzles, the single-shutoff SaberJet™ multi-purpose nozzle, the Zero Torque™ nozzle inlet, and two Mercury™ portable ground monitors.

According to Akron, no other nozzle is as widely used by fire departments in the world today as the adjustable-litreage Turbojet nozzle. It is said to be unmatched in terms of its easy-to-use multiple flow settings and flow delivery rate, which remains the same in all delivery patterns. The low maintenance Akron Assault nozzles provide all of the benefits associated with automatic nozzles including easy control of the flow by the firefighter, enhanced stream performance over a wide range of flows, effortless nozzle operation, and better stream performance at pressures as low as 50 psi [3.5 bar].

The SaberJet was heralded by Akron as the first truly multi-purpose branch pipe, employing the latest in firefighting nozzle technology. It provides the reach, penetration, and low pressure/high flow and CAFS [compressed air foam system] capability of a smooth bore, plus the protection, cooling, foam expansion and ventilation capabilities of a



fog branch, either independently or simultaneously. The branch is capable of operating efficiently at pressures as low as 50psi [3.5 bar] for reduced fire fighter fatigue, or up to 100 psi [7 bar] for maximum flows.

Akron's Zero Torque nozzle is reckoned to be the first nozzle specifically designed with ergonomics, handling, control and reduced firefighter fatigue in mind. The nozzle is kept in front of the firefighter, allowing easier operation and providing better handling and control. The Zero Torque's pistol grip and inlet swivel are innovatively positioned to eliminate the reaction force torque found in all conventional pistol grip designs. Conventional pistol grip nozzles are held at between 90mm to 100mm below the centreline of discharge, creating a natural torque that the firefighter has to resist. The Zero Torque nozzle is designed to eliminate the torque, leaving only the straight reaction force.

The two new Akron Mercury portable ground monitors are the 3,800 lpm [litres per minute/1000 gallons per minute] 3446 Mercury Master 1000™ monitor, and the smaller 1,900 lpm [500 gallons per minute] 3443 quick-attack model. The 3446 is believed to be the smallest and lightest of all of the monitors currently available in its delivery range in the firefighting industry. Its quick deployment ensures that vital time is not lost at the fire scene, and its compact size frees-up valuable space on the fire truck. Both of these monitors can be left unmanned at the fire scene to release fire-fighting personnel for other tasks.

Further information is available by telephone on +44 (0) 161 875 0400, by fax on +44 (0) 161 875 0490, or via email at [tspmarketing.emea@tycoint.com](mailto:tspmarketing.emea@tycoint.com)

More information on the entire Akron Brass range can be found at [www.akronbrass.com](http://www.akronbrass.com)



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# Battery operated backpack power units (12 VDC)

## – for the use of cutters, spreaders and cylinders

SP700 backpack power unit is essential in the case of car, train or plane accidents, where these extreme situations require prompt intervention assuring the maximum of safety and mobility.

**T**he unit is powered by a DC motor with a high power 12V battery, suitable to be helicotered and used also in presence of fuels or inflammables, owing to its non-sparking features. SP700 can be connected to all rescue tools on the market (cutters, spreaders and cylinders etc) working at 350, 630 and 720 bar (5100, 9200, 10500 psi). The battery run-down time is over 30 minutes, and it is easy and fast to replace it with a spare battery. Once worn by the operator (it only weighs 18 kg.), it is very similar in shape and overall dimensions to SCUBA gear and it can be used where traditional gasoline engine power units cannot be brought or used (such as confined and/or poorly ventilated space) and in case of car, train or plane accidents where a high concentration of crash debris caused by the accident do not let the operator get to the rescue sites with traditional units. During the intervention, the operator equipped with SP700 backpack power unit maintains agility and efficient handling which make rescue operations fast and direct, allowing the operator to keep the whole situation under control including accident victims, who will also be spared the additional trauma caused by noise and exhaust fumes created by the old style gasoline driven power units. The total absence of these problems permits operation of SP700 group even in presence of gas and or other inflammables such as fuel.

Maximum practical use is achieved by using our VP700 unit. VP700 back pack power unit has the same features and the same use than SP700 model.

The only difference is the external suitcase container, which is extremely sturdy and watertight until 2 mt. depth.

It is provided of slings in order to be worn by the operator and of slings which let the unit be fastened to the helicopter winch.

Because of its sturdiness and its portability, it is indicated for heavy duties, sea rescue, mountain and tunnels.

We do have further reasons to recommend the use of our back pack power units:

- 1** totally silent
- 2** no polluting (totally absence of exhaust fumes)
- 3** safe (12V tension)



**4** few seconds to activate it, in any weather condition

**5** versatile, it can be connected to all tools in the market

**6** adjustable working pressure between 630 to 720 bar

**7** no long hoses or electric cables

**8** compact, ergonomic, back pack

**9** light and practical when used in confined spaces

**10** unlimited range

**11** unlimited rescue time by battery replacement

**12** free hands transport in order to climb stairs, ladders or to go past obstacles

**13** quick passage in case of mass accident from one vehicle to another

**14** equivalent power of traditional power engine units

**15** it can be helicotered

**16** waterproof until 1 meter depth (VP700 version only)

However, we think these are not all the advantages of these units, because only professionals like you will be able to discover other features during their use.

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4



## Who's the toughest member of your crew?

- A range of thermal imaging cameras designed especially for Firefighters
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e2V



# The Future of Thermal Imaging Technology

To get a glimpse into the future and understand the path that the Thermal Imaging Camera (TIC) and its technology will traverse, one must first take a brief look at how and why we have arrived at the current state of the technology.

**By Wes Sheridan**

Sage Technology

**H**istorically the predominant development and application of the TIC has evolved out of the efforts by the military to function during the night, and by those organizations concerned with observing phenomena in outer space. The first equipment to reach the user was very large, very costly and had poor performance by today's standards. Only governments and research institutions could afford to participate meaningfully in the thermal imaging arena. The issues, in addition to cost, were all about size, weight, power and performance.

It is not a whole lot different today. But the scope of the issues has changed as has the order of importance, and the extent of influence each has in affecting the applications of interest. These issues are about the technology as well as the applications.

Let us first examine the directions of the technology.

**Technology Overview:** It is essential to discuss the technology highlights because the technology issues practically dictate the directions the future TIC will evolve. Besides, you are already confronted with the basics of the technology – it is the

favorite means that marketing uses to convince you that their product is the better choice. Let's take a brief look at the major technology factors (no, you won't need an engineering degree to understand this).

## **It is not just the sensors**

Just about any marketing conversation and product brochure will be quick to reference the sensor technology (eg. Vanadium oxide, Amorphous silicon, etc), the focal plane array (detector) format (160x120 pixels, 320x240 pixels, etc), the thermal sensitivity (<100mK) and typically the spectral response (eg. 7-14μm).

So what does this mean? Probably not nearly as much as marketing wants you to believe that it means. If the camera performs and provides acceptable imagery, has good reliability and fits the budget, these details diminish in importance. For military type applications where the performance is always trying to be advanced, these issues translate into longer ranges, higher quality imagery and improved dynamic response. There is a penalty for these performance improvements consisting primarily of higher costs, increased

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L I M I T E D

**Fire fighting helmets and  
thermal imaging cameras**

**S2 FIRE**



**The smallest and lightest  
fire fighting TIC in the world**

Weighing only 750g with the ability to adapt the camera to suit individual requirements, the **S2 Fire** takes hand held and hands free technology even further.



The **S2 Fire** can be used as a hands-free unit or it can be hung over the neck like a pair of binoculars using the neck strap. It is the lightest and smallest thermal imaging camera in the World. It is suitable for use with all known breathing apparatus and gas masks. As an all round camera with the capability to monitor for fire / search and rescue of victims, there is no better camera for the job.

**Specification includes:**

- On Screen Temperature Display, both graphic and digital
- On Screen Battery Time Remaining
- On Screen Temperature Warnings
- Has White Hot/Black Hot Toggle
- Video Output
- Over 4 Hours Battery Life (With Rechargeable Battery)



Our lightest and smallest, long wavelength infrared camera core

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power consumption and typically size and weight penalties. For firefighter type applications the advancement of technology has less impact. Once you can see in the dark and through smoke, not much real advantage is accrued to a sharper image that is still being viewed through a scratched and fogged air mask, and with beads of perspiration irritating your eyes.

Once the basic performance has been achieved, "good enough is best of all" capability takes on real meaning. At this point the focus needs to be directed to:

- make the unit smaller
- make it lighter
- make it work longer
- **make it cost less!**
- add functionality without impacting any of the above parameters

**It is also about the electronics and software**

The sensor technology has continued to progress to yield camera imagery that can appear nearly as dramatic as black and white video. This has happened with a lot of help from the electronic hardware and software that controls the sensor and processes the sensor data to yield the display image. As the electronics have shrunk to reduce size, weight and power consumption, they have also greatly increased in capacity and functionality to support larger and more powerful image processing programs. These advances in software for the TIC not only provide displayed imagery of unparalleled quality, but they can also deliver imagery from poorer performing sensors that is perceived to be superior to that which can be obtained from more costly and higher performing sensors.

**One must look at the other parameters that go into the performance equation and judge the overall unit performance with respect to the needs of the user. That is the real issue.**

Naturally this contradicts some of the early marketing hype pertaining to the sensor format such as; "a 320x240 pixel array has superior performance to a 160x120 array". Of course it can have superior performance, but not necessarily. One must look at the other parameters that go into the performance equation and judge the overall unit performance with respect to the needs of the user. That is the real issue.

There are presently a number of manufacturers of the sensor core that go into TIC applications, and there are at least four different technologies of types of sensors. There are also other companies that are pursuing new technologies for the sensor, and advanced development of the electronics and software. These efforts may be expected to continue to improve the camera performance and yield innovative features such as expanded

temperature ranges and elimination of the need for FPA shuttering.

Technology Summary: The end result of the technological advances both historically and in the immediate future, will be the sustained improvement in overall performance, the reduction in size, weight and power consumption by the camera core, and a continuing reduction in the cost of the core that will level off at a plateau to be determined by the number of manufacturers, the intricacies of their respective technologies and the volume of cores produced. The specialized nature of the cameras will inherently limit the number of cameras produced, but the core cost could reach the range such that TIC's could be produced and sold for \$4000 to \$5000 in the next few years. This would be a fully functional high performance unit, not the "fire sale" version (no pun intended) that is occasionally seen today when manufacturers purge old technology units.

#### **What if I don't care about the technology?**

If the advances in TIC technology do not hold significant interest for you, it is enough to know that these advances will over time reduce the cost, size, and weight of the cameras while providing for improvements in performance. But there are practical limits to which these advances can reach.

Cost reduction will play a significant role in the future direction of the TIC over the next decade. As the end user cost dips below \$5000 and eventually below \$4000, the TIC begins to take on the character of being part of the firefighter's personal protective equipment. The increased availability and use of the TIC is already resulting in the adaptation and modifications of practices and procedures to better utilize the tools available. As experience is gained and confidence increases, the user community will innovate and discover new and more effective means to save lives and property, and improve safety for themselves and their communities. It is interesting to note that the reports from organizations where each member of the team is equipped with a TIC indicate that migration from old methods to new and innovative methods virtually starts on its own. When each member of a search team is equipped with a TIC, search times are greatly reduced and the safety of the firefighter and rescue victims is increased.

The most interesting futures for the TIC may be found in the new configurations and applications, rather than in the basic functions of the TIC. These new applications have gained increasing interest and support in the last several years, and there are initiatives in process to expand the role of technology in the development of the "digital firefighter concept". The "digital firefighter concept" will bring together the various sensors and displays/indicators into a simple integrated system. The TIC is an integral element of the advancing technology applications in part because it supports two significant features; 1) the incorporation of wireless capability to support data and imagery transfer, and 2) the ability it affords the user to display both thermal imagery and vital safety information. Both capabilities are fundamental to realize the migration to a digital firefighter. And when constrained by standardized means to format, communicate and display data and imagery, the path to the development and

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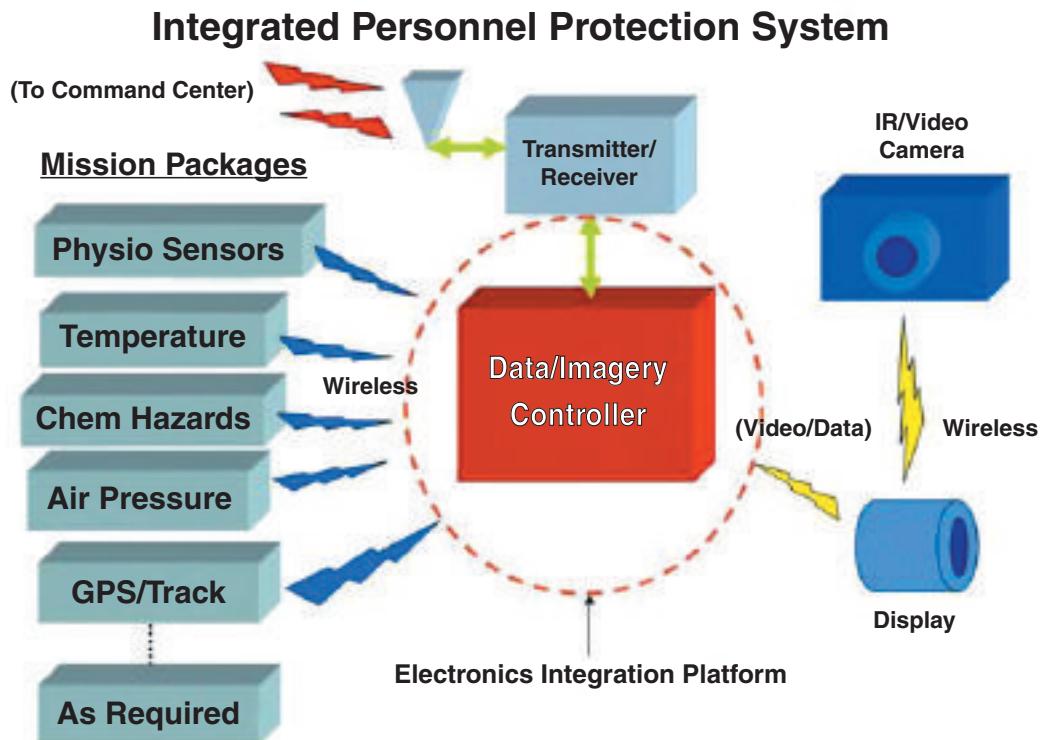
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integration of new systems and capabilities becomes less costly and less burdensome to the firefighter if all of his attention can be directed to a single display for routine and emergency information as well as imagery. Wireless based systems supporting position location, building layout, remaining air supply or team member health emergency status could be communicated and displayed as integral elements with the TIC imagery.

Some of the most dramatic and exciting paths for the TIC will be found in the methods of

figuration to better accommodate the user of the future. Although a sensor/camera is required to capture the image, and a display is required to present the imagery, they do not necessarily have to be located in the same place. Low cost and low power transmitter/receiver modules could readily allow the camera and display to be remote from each other, affording the TIC a variety of new options. A flexible display on an air mask or face shield could be driven by a hand held or helmet mounted camera. Or the hand held camera could drive helmet brim mounted displays on a number

### Sage is presently developing an Integrated Personal Protection System (IPPS) that integrates the sensor data from physiological sensors, chemical and biological sensors and radiological detection sensors into the wireless communications network of a First Responder

**Sage Technology** is a systems development and integration company specializing in advanced development sensor systems for industry and the military. Sage has developed both hand held and helmet mounted "hands-free" thermal imaging camera systems for advanced technology evaluation, and for commercial production applications including firefighter TICs. Sage has experience with virtually every type of detector technology and with many of the suppliers of the sensor technologies found in contemporary TICs.

integration of the unit with other firefighter systems and subsystems. Sage is presently developing an Integrated Personal Protection System (IPPS) that integrates the sensor data from physiological sensors, chemical and biological sensors and radiological detection sensors into the wireless communications network of a First Responder. Both sensor data and IR camera imagery are presented on the TIC display, as well as being transmitted to an Incident Commander's control console. The basic TIC function is retained much as it is in today's systems. But in the integrated environment more systems and subsystems can be monitored and managed by the firefighter/first responder, thus amplifying the capability and effectiveness of the user. An example of the integrated display environment is depicted below.

The TIC may also undergo some radical recon-

of team member's helmets. The camera could be configured like a small flashlight that could also be bracket mounted to a helmet, thus blurring the lines between hands-free and hand held cameras. The associated display could be snapped onto the helmet brim, the flashlight itself, or drive a small modular display inside the air mask. The options are numerous and the user will be able to select the best fit for the application.

The technology is already mature enough to meet the needs of the first responder community. It works and works well. Over time the costs will decline somewhat, and the size decrease will help determine new implementations. However, the application innovations and the integration approaches will be the primary fuel that powers the transition to the next generation of thermal imaging cameras.

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# 3M Thermal Imaging Camera – designed by firefighters for firefighters



DIVERSIFIED TECHNOLOGY company 3M develops the FF131, a thermal imaging camera designed and engineered by firefighters for firefighters to provide reliable, high quality thermal imaging.

As the leading thermal imaging camera of its type, the 3M FF131 infrared imaging camera has been crafted to assist firefighters as they navigate smoke-filled and burning buildings in search and rescues. It combines advanced detector technology with an innovative, task-orientated mechanical design and is completely self-contained with no external cables or components to catch or impair movement.

Sarah Broadbent, from 3M's Technical Support Team said: "This is a specialised product that will be sold only to fire and rescue services. According to users in Europe, this rugged and robust camera provides the best picture quality on the market. The screen is very bright, which makes the images highly viewable."

Whether standing, walking, crawling or kneeling, firefighters can rely on the FF131 to 'see' the scene. The camera has many innovative features including a MicroR microbolometer detector that includes the VOx sensing material offering the highest sensitivity to heat (0-600°C viewable temperature range), a high resolution, fast update rate, and wide dynamic range. Another integral feature is the digital temperature measurement, including InfoTherm, which enhances situational awareness by applying a colour palette to temperatures around the combustion point of paper and wood products.

The ergonomic design provides a variety of holding positions for maximum flexibility, including the ability to look under, over and around obstacles. It is designed to be carried low, near the waist, relieving strain on the shoulder and distributing its weight throughout the arm. The camera has a large display for clear viewing, even in darker smoky atmospheres; large controls which are easy to reach with one hand; and a quick and simple battery change.

The 3M FF131 boosts search operations at the scene by providing search and rescue crews with spatial awareness in dark, smoke filled environments and recognising thermal signatures on fixtures and fittings. It is a very useful tool for checking for fire extension, to view burned material and look for hot spots, aiding the possibility of quick, complete extinguishment and early release of the search and rescue crews. The camera's broad dynamic range also helps search crews to see objects of differing temperatures simultaneously.

The FF131 can be used to identify potential flashovers or back drafts, determining where ventilation and hose lines are needed. In this situation it can scan entire rooms in search of victims, firefighters in trouble, fire extension and ceiling-level heat wave build-up.

**For more information about the FF131 please visit [www.3m.co.uk/tic](http://www.3m.co.uk/tic) or call 0870 60 800 60 in the UK or 1-800 320 500 in Ireland quoting 'PTIC'.**

## Bullard T4

A RECOGNIZED LEADER in fire safety products, BULLARD understands the importance of reliability, accuracy and durability to firefighter products when disaster strikes. Launching their first thermal imager in 1998, Bullard thermal imagers are now the number one choice of firefighters.



The newest innovation in thermal imaging technology, the **Bullard T4** thermal imager, pioneers jaw-dropping new features starting with an ultra-high resolution infrared engine and the industry's only widescreen liquid display. The 320 x 240 resolution and wide screen produces maximum performance and clarity, giving firefighters the capability to see clear vivid imagery in the smokiest conditions. Offering the exclusive Super Red Hot™ feature, the T4 pinpoints fire source and progression while delivering revolutionary thermal imaging color technology. The 2x and 4x digital zoom delivers up close viewing of distant and hard to reach areas while Electronic Thermal Throttle™ enables firefighters to reveal hidden fires and distinguish hotter objects. Providing an advanced relative heat indicator that measures temperature, the Bullard T4 thermal imager is the most sophisticated firefighting thermal imager available in a lightweight and rugged design.

In addition, Bullard offers the most versatile small form factor thermal imager on the market, the **Bullard T3MAX**. Designed for interior operations and useful for analytical operations, the T3MAX is the ideal thermal imager for departments that demand the highest performance in the smallest package.

If one-button simplicity is what you're looking for, you'll appreciate the **Bullard T3XT** thermal imager. Designed with interior fire operations in mind, the T3XT has a 3.5" LCD, enabling clear viewing in smoky conditions.

Used in conjunction with any T4 or T3 Series thermal imager, the **Bullard SceneCatcher™** simultaneously captures 60 minutes of video, as well as 300 still images from the Bullard Thermal Imager. Allowing firefighters to show actual images from a fire, the SceneCatcher serves as a useful tool in future training presentations. The SceneCatcher is housed in a handle which can also include a transmitter. With the optional two-channel transmitter, firefighters can send images and video from a single camera and transmit to one or more receiving devices.

Bullard is a leading manufacturer of personal protective equipment and systems worldwide. Product lines include respiratory protection devices, thermal imagers, hard hats, and firefighter and rescue helmets.

**For more information, contact [info@bullard.com](mailto:info@bullard.com) or Bullard Customer Service at 877-BULLARD.**



# For a better perspective

## New thermal imaging camera from Dräger



DRÄGER PRESENTS a new generation of internally-developed thermal imaging cameras: the Dräger UCF® 1600 and the high resolution Dräger UCF® 3200. The Dräger UCF 1600 has a picture resolution of 160–120 pixels. The Dräger UCF 3200 has a high resolution of 320–240 pixels and simplifies the documentation.

Both cameras use the advanced micro bolometer technology based on Vanadium Oxide detectors which delivers superior picture quality.

Applications for thermal imaging cameras are many-sided including use in fire fighting, orientation in darkness or in smoke-filled rooms, finding people, and accidents with hazardous materials e.g. to analyze the content of tanks/vessels.

The sensor technology of a thermal imaging camera makes the thermal radiation of a person or an object visible. It is displayed graphically on the camera screen.

The major advantage is the possibility to localize people and objects clearly without any hindrances from external influences such as thick smoke or darkness. Thermal imaging cameras can deliver clear images where normal cameras or night vision devices fail.

Dräger UCF 1600 and Dräger UCF 3200 use a digital 2x zoom to double the picture size. Another standard feature is the six predefined color palettes, which enable optimal viewing of the thermo graphic images.

The smart battery manager constantly monitors the battery and give the user information about the true remaining capacity at all times and especially when the batteries are almost empty.

Recharging can be done by the standard desktop charger in less than 3 hours. For storage in a truck, a truck charger can be used which fits a camera (with or with-

out an attached handle) and an additional battery pack and keeps them constantly charged and ready for action.

A wide variety of accessories are available to add features to the cameras in a modular way: A basic handle can be attached to the camera which makes handling of the camera easier, the handheld is especially designed for crawling. For wireless transmission of the live infrared video or for recording of single images or videos, handles with these special features can be attached as well. To display the transmitted video, there are different receivers available: command center and handheld.

Both cameras have the same casing and interfaces and therefore all the available accessories can be used with both models.



**For more information contact:**  
Christine Reimann  
Tel: +49 451 882 1547  
Email: christine.reimann@draeger.com

# Dräger



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# Evolution® Thermal Imaging Cameras

## For every application the optimal TIC model



WITH MSA'S ENHANCED series of Thermal Imaging Cameras you can choose between three high-tech camera models. These models feature the same ergonomic and lightweight design: <1.3 kg, robust components, and extreme durability. Their image quality is best-in-class. Functions like instant-on, two different temperature sensitivity modes, shutter indicator, quick-temp and Heat Seeker PLUS are integrated into all TIC models. In addition, the individual features of each TIC model have been designed to meet the specific requirements of a variety of tasks and applications.

The innovative **EVOLUTION 5200 HD<sup>2</sup>** features the most brilliant, high resolution images available. With its 320 x 240 pixels sensor and the optional 2x digital zoom, it is the perfect tool for challenging fire-fighting and police tasks. This versatile TIC provides the most detailed images (with a focal plane of 320 x 240, 80,000 pixels) over the widest temperature range, in addition to all safety and MSA-exclusive features of the

Evolution 5000-Series cameras.

The **EVOLUTION 5600** offers the best imaging in firefighting with high resolution, excellent picture quality, and ergonomic design, all at a price point that every fire department can afford. Offering excellent value for money it is the optimal solution for applications requiring a speedy overview.

MSA's all-rounder **EVOLUTION 5200** offers high image quality and the widest viewing angle. Designed to meet various requirements, it is the best camera for a wide range of applications.

The new **EVOLUTION 5800** will also be available soon. With the best imaging in firefighting, it features higher resolution, improved picture quality, 2x digital zoom, and color palettes. This most versatile TIC available provides them most details images with Image Digital Enhancement (ID) over the widest temperature range with user selectable color palettes, in addition to all safety and MSA-exclusive features of the Evolution Series cameras.

The practical modular system allows all cameras to be enhanced with a Video Transmission System or a Video Capture. The Video Transmission System gives the back-up team an insight into what is happening at the site of the fire in real time. Furthermore a unique Video Capture for documentation purposes can be easily adapted to all three cameras.

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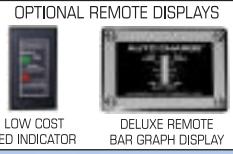
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# GB SOLO Ltd

Established June 1996, are proving to be leading the way with new technology in the thermal imaging world



FOR OVER 11 YEARS now they have been designing and manufacturing TICs which are supplied all over the world.

Although they supply their products to a number of industries, their main market is the fire industry. Not only are their products supplied to fire brigades or countries, they are also supplied to fire teams on oil rigs, cruise liners, navies and power plants.

GB SOLO have a range of products to be proud of, though the current GB SOLO TIC's are the S2 and the SOLOTic.

The SOLOTic is the ultimate all in 1 helmet offering protection, communications, breathing and sight. The fact that a fire fighter can be kitted up in a matter of seconds rather than minutes means that they can be in a situation within the vital stages. The SOLOTic is completely hands free and means that the user has complete mobility and no restrictions for the job in hand.

The S2 Fire is the newest addition to the GB SOLO family, this unit is the smallest and lightest TIC in the world and has been designed specifically for fire fighters. The S2 has the adaptability to be used as either a handheld or hands free TIC meaning that once again the user can have complete mobility for the task in hand. The S2 has been received by the world fantastically, so much so that orders were placed before the unit had even gone into production. The S2 standard features include on screen temperature and battery display, video output, white hot/black hot toggle switch and over 3 hours battery life. Every S2 is built to last and are IP67, drop tested, heat tested, CE and EMC approved,

If you think that the S2 is 'THE' product to have, we've now gone one better, just in case you want a bit more. The S2 Plus will be available to buy in the next month, it looks exactly the same as the S2 but the software is something that has never been seen in a TIC world. A few of the S2 Plus features include a menu option to select mission specific options, automatic or manual image capture, mission statistic capture and colour mapping. Software is also included to enable you to download the images and statistics to your computer.

For further details on any of the GB SOLO range visit our website at [www.gbsolo.co.uk](http://www.gbsolo.co.uk)



## Prioritise FireFighter Safety

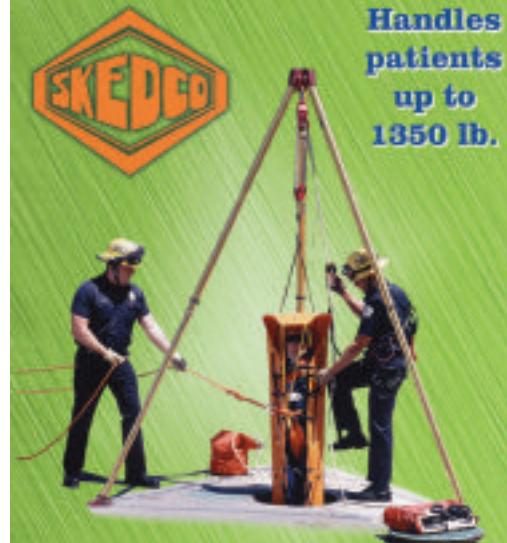
ISG DESIGNS, DEVELOPS AND MANUFACTURES firefighting thermal imagers utilising a range of solid-state infrared sensor technologies, with over ten thousand imagers installed in fire, police and naval departments in over 75 countries worldwide. ISG has been innovating safety-enhancing features continually for almost two decades, enhancing product capability and maintaining world leadership in the provision of superior performance thermal imagers for firefighting. Renowned image clarity, straightforward user functionality and powerful performance – all these add up to major benefits for firefighter safety. ISG is the only provider to concentrate solely on thermal imaging. This focus has created the capability to achieve world-leading innovations time after time.



### History of ISG

ISG Thermal Systems Ltd was founded in 1992 by two firefighting thermal imaging professionals. After developing and supplying a string of infrared fire detection products, during 1994 the company

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launched its first firefighting thermal imager – the 'Talisman K90', utilising pyroelectric vidicon tube technology and achieving performance levels far superior to other firefighting thermal imagers of the time. The product soon became popular with fire brigades in the UK, USA and Europe.

Building on commercialisation of solid-state detector technology by Texas Instruments and Raytheon Corporations in the United States, during 1996 ISG became the first in the industry to utilise UFFA (Uncooled Focal Plane Array) technology in the revolutionary Talisman K90C. It became a instant success, establishing ISG as the leading provider of thermal imaging for firefighting. A series of innovations followed, including temperature measurement, video transmission and digital zoom. ISG's US subsidiary was incorporated in Atlanta in 1998 to provide better support for the rapid growth of sales in the United States. The success of the K90C won ISG the Queen's Award for Enterprise in International Trade in 2001.

2002 saw the launch of the K80 Spirit, utilising the size and cost benefits provided by  $\alpha$ -Si (amorphous silicon) microbolometer technology to introduce a new generation of compact, "small-format" imaging products.

Another industry revolution occurred during 2003 as ISG launched the 'Talisman Elite', the first full-resolution microbolometer imager to appear in small format. The Elite also featured the groundbreaking Dual Transparent Colour feature, providing the user with 1000°C imaging and measurement capability. For the first time the firefighter had a tool which could provide clear, intuitive imaging and measurement in flashover temperatures and beyond. These features were introduced in the lower-resolution, economy Elite Lite version in 2005.

In 2006 the company succeeded in combining the high sensitivity of VOx (Vanadium Oxide) detector technology with the high-temperature imaging features of the Elite. The K1000 Elite VOx also set new standards of economy and has become one of ISG's most successful products.

Continued investment in development and product enhancements led up to the launch of a completely new product range in August 2008 – the 'SD SERIES' and 'K SERIES', providing the market with the opportunity to tailor the product's imaging

and display capabilities to meet individual needs and cost targets. The SD and K series imagers also feature the next essential innovation for firefighting – ICE™. Utilising ISG's revolutionary, patent-pending Intelligent Contrast Enhancement algorithm, ICE™ cameras produce enhanced image clarity in background detail in the cooler areas around a hot scene, simultaneously with full details of the heat source, thus providing the firefighter with vital scene information to see more and make better-informed decisions.

For more information, please visit  
[www.isgfire.co.uk](http://www.isgfire.co.uk)

For more information on ISG thermal imagers contact:

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# ARGUS4 HR320 joins the Argus range

With over 30 years in the thermal imaging business, e2v's engineers continue to lead the way in delivering the latest thermal imaging technology to the world's emergency services



THE ARGUS4 HR320 is latest fire camera to join the Argus range. With its 320 x 240 high-resolution detector, and high definition LCD screen, it provides by far the best image quality of any hand held thermal imaging camera on the market today.

Argus cameras utilise a Microbolometer sensor, matched with electronics designed and manufactured by e2v, ensuring that quality and durability are built in. Argus cameras are designed to the highest specifications to instil confidence in emergency services personnel that they are using the best thermal technology available to them.

The Argus4 HR320 infrared remote control and PC software allow end users to configure the camera to their specific needs. Once a fire fighter's settings have been chosen, simple button operation allows the user to switch the camera on and off, take pictures, and activate the x4 digital zoom facility.

The camera is extremely light, weighing less than 3lbs (1.3kg). It comes packed with the most advanced features available on the market today, these include:

**Enhanced Dynamic Scene Colourisation (EDSC)** This feature provides the user with an opportunity to colourise the thermal image. With the Argus4 HR320 the dynamic scene colourisation has been enhanced to give the user greater information.

**Direct Temperature Measurement (DTM)** This feature displays the temperature of objects within a defined area of the thermal scene.

**SceneSave™ Digital Image Capture** The Argus4 HR320 can capture and store up to 100 images. These can then be viewed or deleted using the remote control supplied. Using the software provided the captured images can be downloaded to a suitable laptop/PC and then exported in various formats.

**Tri-Mode Sensitivity** The Argus4 HR320 now has an expanded third level of sensitivity for very high scene temperatures, enabling clear imagery at all temperatures. This expanded temperature range means that temperatures in excess of 1000 degrees celcius can be identified.

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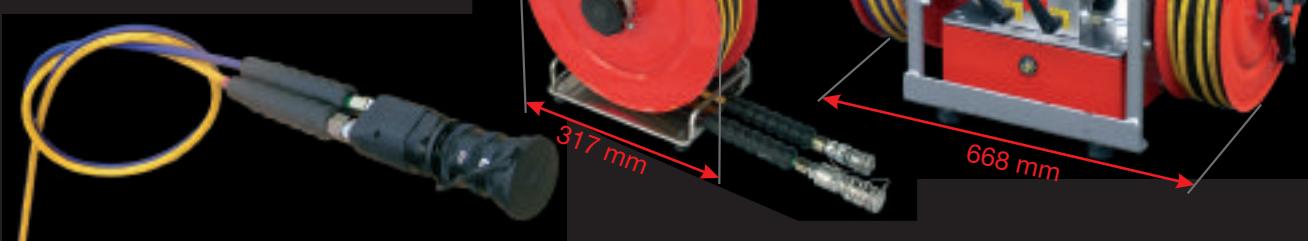


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# Fire Fighting

## – the latest technology for vehicle mounted pumps

**By David Burton**

Hale Products Europe

There are a number of different vehicle mounted pump designs available to firefighters worldwide and one of the key distinctions is how many stages are required to generate the different pressure outputs required. Since the mid 1960s in the UK, the availability of high flow/low pressure simultaneously with low flow/high pressure has been accepted as standard, and how that combination of flows/pressures has been achieved is due to the success of innovative new pump designs.

One of the first manufacturers to introduce a low and high pressure stages on a single shaft was Godiva Fire Pumps (later Hale Products Europe) with the Universal Multi-pressure pump (UMP), the innovation of placing two impellers on a single shaft meant greater efficiency and performance.

Combined with the use of light alloy the UMP and successive Godiva pumps became standard equipment for the UK fire service and many overseas brigades from the 1960s onwards.

The use of lightweight aluminium transferred to the portable pump sector where issues of weight, portability and compactness are critical. Portable pumps have also benefitted from utilizing the latest in two cylinder, air cooled engines to provide an impressive power source from minimum weight and size.

In a global market many pump manufacturers will ensure their products comply with the most respected engineering standards – in Europe it is with the EN rating system, this provides a performance rating based on the discharge flow and pressure, i.e. 2000 litres/min at 10 bar,



3000 litres/min at 10 bar, 4000 litres/min at 10 bar and 6000 litres/min at 10 bar. The acceptance of this standard is a valuable benchmark for assessing pump capability. For the North American market the equally demanding NFPA standards are important for a pump to meet and exceed in terms of performance and quality.

Issues relating to the pump installation envelope are also becoming more critical. If a vehicle mounted pump can be more compact, without compromising performance, the vehicle builder has more room to accommodate other life saving equipment, e.g. extrication tools, ventilation fans and thermal imaging cameras.

Combined with the drive for vehicle pump compactness is the need to make pumps easier for vehicle builders to install and pump maintenance technicians access. The addition of an integral mounting platform provides a number of beneficial features – the platform will be designed to suit the most common vehicle chassis structure, allowing the whole pump to be quickly and easily secured. The platform will also incorporate drainage taps at the front which are linked to the bearing housing for oil replacement and pump volute for water draining, both key maintenance activities. The mounting platform is also fitted with anti-vibration mounts which help reduce noise during use, another vital advantage during fire fighting operations. Another new installation feature of the latest vehicle mounted pumps is to make the suction connection project from the pump body at a shallow angle or even completely horizontal, thus avoiding any clashes with the vehicle pump bay floor structure. Also in the area of water supply issues is the inclusion of an optional integral collecting head for hydrant feed operations. Multiple tank to pump feed points also make pump installation more flexible. All these features make the pump more compact to install for the vehicle builder and easier to use for the fire fighter in the field.

Pump priming is also an area designers have improved in recent years. The latest reciprocating piston primer systems require less space in the overall design, and by using an electromagnetic clutch are more efficient and reliable – there are less moving parts to wear, less noise and less fuel consumption and emissions. The modern piston

primer uses less water (therefore is exposed to fewer abrasives), primes at a lower idle speed and is fully automatic in operation, again making the pump operation easier.

Another area of concern for pump designers is the use of the latest materials to ensure a long pump life with reduced maintenance costs and a stronger pump construction. The modern vehicle pump will use stainless steel in the critical areas and high grade Aluminium elsewhere to provide strong resistance to the corrosion problems associated with deteriorating water quality and for use in marine environments. The inclusion of polymer wear rings is another feature to improve the pump wear characteristics.

Apart from performance and reliability issues the modern fire service is always seeking to reduce operational costs and the modern vehicle pump assists this drive by making maintenance easier and quicker – more parts are of a modular design and important parts such as seals can be accessed in-situ without major castings being removed.

Environmental concerns are increasingly influencing pump designs as fire services address issues such as fuel consumption and exhaust emissions. The more efficient a pump design is the less power it will draw from the vehicle engine, thus improving fuel use and reducing pollution.

The Godiva Prima pump (illustrated here) exemplifies all these latest design innovations and leads the way in vehicle pump design. The first production run is now reaching operational use with UK fire services and the positive reports are confirming the Godiva reputation for innovation, performance and reliability.

In addition to the two pressure discharge pump, there is now the option for a triple pressure range – this design has evolved to meet the needs of a new type of vehicle, the combined aerial rescue platform or CARP for short. This vehicle provides the water pumping capability of a standard appliance with the option to use an aerial ladder. To provide water discharge at the top of the ladder the vehicle pump has to provide a flow of approximately 2400 litres/min at 14 bar, while simultaneously supplying the hand line discharge at 1500 litres/min at 6.5 bar and the high pressure hose reels with 400 litres/min at 40 bar. A pump such as the Godiva Prima Triple Pressure Range pump is capable of supplying these discharge pressures from one unit. The Godiva pump is a modification of the field-proven World Series model, it combines the existing WT low pressure centrifugal impeller and high pressure re-generative impeller with a modified discharge manifold to provide the three different pressures. Thus making the CARP appliance a truly versatile tool.

Further notable developments of vehicle pumps are the inclusion of a Compressed Air Foam System (CAFS). CAFS is gaining increasing interest from UK and overseas Fire Brigades as a more efficient and environmentally safe method of fighting most types of combustible material fires including structural fires.

A number of Brigades are currently trailing CAFS equipment to assess the key benefits of using CAFS equipment. The main benefits can be summarised as –

- Quicker knockdown times of fires.
- Quicker reduction of heat – cooler environment.

- Massively reduce water damage.
- Reduced environmental damage.
- Less exposure for firefighters to hazards of firefighting.
- Simple to use – no special training required.
- Reduction in firefighter fatigue due to reduced suppression time and effort.
- Less water needed.

In structure firefighting applications, a CAFS unit using Class A foam works well when applied on burning synthetic fuels associated with interior furnishings and finishes (such as foam chair padding). These synthetic fuels are hydrocarbon based and give off much higher rates of heat release and burn at higher temperatures than their non-synthetic counterparts. The benefit for first attack teams is that CAFS provides the extra punch needed to knockdown and douse dangerous synthetic burning materials.

Class A foam concentrate is classified as a synthetic detergent hydrocarbon surfactant and is related to triple strength dish detergent. Its components reduce water's high surface tension to effectively make water penetrate the crevices found on fuel surfaces. Additionally, it contains foaming agents that create bubbles when the foam solution is agitated with air, as in a compressed air foam system. The bubbles created keep the water contained within them in contact with vertical surfaces to provide efficient fuel cooling. Class A foam clings to fuels instead of rolling off, preventing the fireground water waste associated with conventional water fire streams.

When initial costs such as CAFS hardware can be proven to be a benefit, they are no longer an expense, but rather an investment. CAFS technology makes good economic sense, because it reduces property damage and increases firefighter safety.

A fire appliance equipped with CAFS contains a high-volume air compressor (50- to 200-cubic feet per minute in size) integrated with a foam proportioning system and the normal centrifugal vehicle pump.

In a CAFS unit, foam and water are mixed at a preset proportion and then compressed air is injected into the solution, prior to discharge into the hoseline. The benefits of using CAFS, over using standard branches and foam nozzles to generate finished-foam, include higher quality finished-foam production, lightweight hose lines,



increased fire stream discharge distance and finished-foam consistencies that range from "milky" wet to "shaving cream" dry. The benefits for the fire officer are increased flame knockdown capability from a limited water source, better exposure protection, less fatigue by using light-weight CAFS hoses (hoselines are filled with a partial volume of air) and increased penetration into burning structures to reach the core of the fire.

The potential of CAFS offers the ability to deliver large quantities of foam solution over long distances with the minimum manpower to attack structural fires that previously required massive tactical operations. Initial attack time should be reduced on most fires. For those fires which are not knocked down with the initial attack, sustained combat time should be reduced. Overhaul and mop-up times for all fires should be reduced. Implementing CAFS can significantly improve fire suppression capability.

A typical CAFS unit is the Godiva World Series with integrated CAFS, a unit where all the main CAFS components are part of the pump package – air compressor, foam pump and mixing manifold. This makes the unit easier for vehicle builders to install and connect as all parts are in one location instead of located around the vehicle structure.

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# Urban Search and Rescue goes mainstream

9/11 is seen by many as a defining moment in the history of search and rescue. The terrorist attacks on New York and Washington brought the need for urban search and rescue capability into sharp focus. Until then, many search and rescue operations had been carried out by specialist teams trained to work in areas devastated by natural disasters – many in remote regions of the world.

**By Roger Startin**

Bristol Uniforms

**S**ince the escalation of international terrorism, signalled by the attacks on the Pentagon and World Trade Centre, targets have not only become focused on western democracies but on centres of high population densities for maximum impact in terms of human injury and devastation of economic infrastructure. This has required a total rethink of the response needs in what has become *urban* search and rescue. Man-made disasters have the potential to include a wide variety of damaging and polluting agents not found in most natural disasters. To protect rescuers fully from the range of threats involved, the latest USAR PPE incorporates protection against a number of health hazards.

Urban search and rescue is now considered to include incidents ranging from terrorist chemical, biological, radiological and nuclear (CBRN) attack to chemical spills, industrial, traffic and domestic accidents and building collapse. USAR also covers

the full range of natural disasters including floods, earthquakes, hurricanes and volcanic eruptions.

In the UK increasing numbers of municipal fire brigades have taken on a much wider ranging role as reflected in the fire & rescue name now adopted by many to better reflect this broader responsibility. The government's recognition of the essential nature of urban search and rescue in today's major centres of population around the world was amply recognised with the passing of the Fire and Rescue Services Act 2004.

Firefighting roles have expanded to include attending forest, shrub and grassland fires, for which specialised wildland PPE has been developed and introduced, as well as hot fires involving highly flammable substances, such as chemicals and oils, where protection against high flame temperatures at close proximity has created the need for greater levels of protection from the fabric combinations used in advanced PPE. In a



similar way, the expansion of the firefighter's role into non-firefighting activities, such as buildings collapse and road traffic collisions, has brought with it the introduction of more specialised PPE designed specifically to meet the demands placed on the wearer. USAR kit falls squarely into this latter category.

The UK has a successful record for urban search and rescue. The United Kingdom Fire Service Search & Rescue Team (UKFSSART) provides an international search and rescue facility for the UK

**The latest designs of USAR  
PPE incorporate fabric  
combinations which recognise  
the special conditions under  
which search and rescue  
personnel work and differ  
significantly from the makeup  
of structural firefighting  
ensembles which are still in  
USAR use with some fire &  
rescue services**

Government and is on call 24 hours-a-day, 365 days-a-year to respond to an accident or disaster anywhere in the world. The team is composed of firefighters and other specialist rescue personnel working within the emergency services of the United Kingdom. It is also one of a number of teams registered with the United Nations. The team has, over the last fifteen years, successfully carried out search, rescue and relief missions around the world.

UKFSSART has also been declared a European USAR resource and could be committed to incidents within the European Union. Highly mobile, capable of being rapidly transported by helicopter or aircraft, UKFSSART is capable of providing a variety of support services to emergency agencies. Support includes specialist advice, canine search teams, specialist search and rescue equipment and complete search and rescue teams able to be deployed at short notice.

A number of countries in Europe have begun to recognise the specific advantages of USAR protective clothing and fire and rescue services in Holland, Finland and Portugal have already taken delivery of consignments of Bristol's USAR PPE over the last 2 years. In addition, services in both Greece and Croatia are in the process of initiating test programmes for the rescue kit as are those in Mexico. There seems little doubt that the growing interest across Europe is beginning to spread to other parts of the world, especially in those countries more susceptible to natural disasters such as earthquakes, typhoons, hurricanes, coastal flooding and volcanic activity which all result in serious infrastructural damage. Collapsed buildings are often the cause of greatest loss of life but immediate search and rescue teams suitably clothed and equipped can often effect extrication of the injured and trapped and thereby save many lives which might otherwise be lost.

In the UK the government's response has been the New Dimension programme which is intended to enhance the previous levels of expertise. Since late 2003, an interim Urban Search and Rescue capability has been in place and there has been a roll out programme across England and Wales. The roll out across 17 Fire and Rescue Services has been a phased approach and will eventually complete in 2008.

The USAR capability includes equipment to lift, cut and remove rubble from collapsed structures, and to locate casualties. It also brings with it the need to develop new skills including the ability to

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work in confined spaces, safe working at heights carrying out search and rescue operations in a multi-level collapsed building, technical search and shoring, breaking and breaching skills. Activities which include lifting and moving, using basic

principles coupled with modern technology, to move and stabilise heavy masses place special stresses on the rescuer's body which in turn call for appropriate levels of protection and support whilst reducing heat stress to avoid early exhaustion.

The latest designs of USAR PPE incorporate fabric combinations which recognise the special conditions under which search and rescue personnel work and differ significantly from the makeup of structural firefighting ensembles which are still in USAR use with some fire & rescue services. The main differences are occasioned by the working conditions which, unlike firefighting, do not involve the presence of either fire or hosed water. Without the need for protection against flame and heat the outer fabric is selected more for its protection against physical damage and noxious fluids and chemicals. It also incorporates an inner membrane giving protection against rain, bodily fluids and pathogens.

The effect is to allow the USAR kit to become a two-layered construction affording much greater flexibility and wearer mobility and comfort in the confined and constricted working conditions frequently found in fire damaged and collapsed buildings. The lightweight construction also helps to reduce internal heat build-up when working in hot and airless conditions often encountered in urban rescue situations. In the Bristol Uniforms offering the coat and trouser combination incorporates a 220gsm Nomex Ripstop outer shell in Orange with a Goretex Crosstech membrane. Easily identifiable at multi agency incidents the

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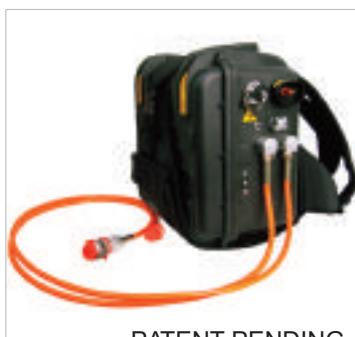
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coat and trouser can be zipped together to give the advantages of a one-piece but retaining the flexibility of a two-piece garment. Other scenarios calling for USAR PPE include dealing with road traffic collisions (RTC) where the rescue crew are likely to be exposed to oil and fuel spillage, contamination from bodily fluids and the need to work in cramped conditions when entering badly damaged or crushed vehicles to help recover injured occupants.

Under new operational and response guidelines the teams must be able to respond to any major unstable or collapsed structure or major transportation incident as part of a national response. To achieve this objective, and meet defined performance standards, the team must be able to respond within 45 minutes along with the on-call personnel. It is now increasingly common for fire & rescue services with a defined USAR responsibility to carry the USAR team's PPE on designated vehicles at all times to help speed up response times and to allow the decision on deployment of PPE to be made on location once the operational needs have been assessed.

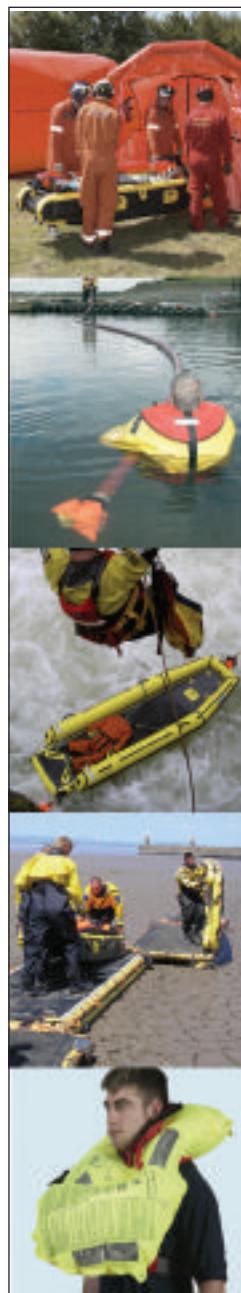
The New Dimension Urban Search and Rescue Project (USAR) developed the response capabilities in order to deliver the equipment and training to seventeen selected Fire & Rescue Services (F&RS). The guidance identified the process and funding to supply USAR personnel with a national standard for specialist tools and protective clothing in those F&RS to allow the safe and effective deployment of these teams in the event of any of the identified potential disaster scenarios happening.

In order to effectively deliver such a capability, funding was provided to supply a certain amount of PPE for initial issue to USAR teams. Merseyside and Cheshire were nominated to form a joint team by the government with an identical set up with Lancashire and Greater Manchester FRS. The

UK's Department of Communities and Local Government, following a risk assessment and hazard analysis of operations, produced specification documents identifying a minimum level of protection required for the PPE.

Merseyside Fire & Rescue Service had, in partnership with Bristol Uniforms Ltd, designed and developed a garment to meet the requirements of Search and Rescue activities including RTC, collapsed structures, line and other specialist rescues. This led to an original USAR design, using a red outer layer, and 100 sets of coats and trousers were supplied to Merseyside Fire & Rescue in early 2005.

Having just completed a joint project for the procurement of firefighting PPE, Merseyside F&RS approached their regional partners with a view of producing a similar contract for USAR PPE. The process led to a number of alternative constructions being offered by PPE manufacturers



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and suppliers. These submissions underwent technical and commercial evaluations and resulted in Bristol Uniforms securing the contract to provide an ensemble that was fully suitable for purpose.

Ian Voce, Merseyside's Technical Officer and PPE budget holder, commented on the programme. "Following the introduction of the original USAR kit the DCLG developed new guidelines which specified the incorporation of a ripstop outer fabric in orange as the new standard colour for urban search and rescue PPE. This meant our entering a new technical evaluation and commercial procurement process with a number of potential suppliers whose garments were submitted to a series of wearer tests by the USAR team members. These trials included fit, comfort, flexibility and level of wearer protection. Bristol's design was again selected based on its overall evaluation as being most fit for purpose".

"The procurement process, led by Merseyside Fire & Rescue Service, was entered into on behalf of Lancashire, Cheshire, Greater Manchester who form the North West Consortium along with Cumbria. All four fire services have now taken delivery of the orange USAR kit which has been operationally deployed since spring 2007. The original red ensembles are now regularly in use for training purposes".

Early in 2007 year a small team of USAR specialists travelled to Texas at the time of Hurricane Dean and worked alongside the emergency responders of the State of Texas to observe and bring back information vital to improving the UK's response to major storm incidents. The team, comprising

officers from Merseyside, London, West Midlands and Hampshire participated in the debrief process following the demobilisation of the local USAR teams after which they returned to the UK at the end of August shortly after the hurricane dissipated.

Recent examples of the deployment of specialist USAR teams include the fatal hotel blaze in Newquay in August last year. Rescue specialists from the Devon & Somerset USAR Unit assisted colleagues in Cornwall offering information and advice regarding search operations in the partially collapsed Penhallops Hotel in Newquay. In another incident in June 2007 a man who was trapped when the top two floors of a building in Westminster collapsed was freed by crews from London's specialist USAR Units.

Roger Startin, Bristol Uniforms' Joint Managing Director told *International Firefighter*, 'The move to develop and provide the FRS with more specialised PPE in recent years has been made possible by a combination of the availability of a range of new, high performance materials and fabrics and the PPE design capabilities in the UK from companies like Bristol whose international reputation for innovation in PPE is reflected in our presence in over 110 countries around the world'. He added, "The roll out of the USAR capability within the designated units across the UK has increased the awareness of the special needs of USAR personnel in terms of their protection and safety and the USAR kit now available reflects the design work put into addressing the personal protection requirements to meet the wide range of risks involved in USAR work".

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# The future of SCBA

Since the creation of the first "fire service", the situations and types of hazard they face have significantly changed. With the sustained development of town and cities, urban communities have become much more densely populated, with buildings increasing in both size and height.

**By Tony Pickett**

Product Manager  
Breathing Apparatus,  
Scott Health & Safety



**T**he population of rural areas has also increased, resulting in rural areas requiring the presence of a fire service, in areas where previously fires could "burn out" without human intervention. These fires are now fought to protect human life and property. Terrorism and its surrounding threats have also led to a change in the role of the fire service; respiratory protection may

now be required for prolonged durations with the protection against CBRNE threats. There is also an increased need for urban search and rescue operations. As the role of the fire services have changed so have their requirements for their equipment.

From the advent of respiratory protection in the 1870s, when fire fighters utilised a simple

respirator and filter, technology moved on and Breathing Apparatus (SCBA) became considered to be the basic tool for structural fire fighting,

When first used in the 1920s, CABA duration was approximately 20 minutes. Since this time, major advances have taken place. Cylinder technology used on SCBA has developed from heavy steel to alloy steel, aluminium to glass-hoop wrapped aluminium and glass full-wrapped cylinders to the current technology of fully wrapped carbon fibre cylinders with steel, alloy or plastic liners. In most cases, the maximum filling pressure of these shells is either 200 or 300 bar. As well as cylinder advances, CABA have moved from negative pressure to positive pressure via a manual switching mechanism, to the current first breath activated positive pressure systems. Equipment in use today has come to use high performance technology in demand valves, pressure reducers, face pieces and integrated electronics.

available in the market place and sets that can be adjusted to the users size and shape and allow more natural movement whilst being worn are now common place.

### **Duration**

Extending duration is also a requirement and reducing the energy used by the fire-fighter is a small way of doing this but to have any significant increases different solutions will need to be considered. One way is to carry more air on the BA set, this presents challenges as air does have a significant weight to it. People may think that air weighs nothing but 45 minutes worth is 2.3kgs, to carry more air you also need to use larger cylinders or duo them which of course adds more weight and before long you have exceeded the limits laid down in the standards. Currently one and a half hours is approximately the maximum limit. There are various ways to look at things for the future such as increasing cylinder pressures (higher

## **So where does the future of breathing apparatus lie?**

**Performance wise; modern BA sets easily perform well above the necessary level required to support the fire fighter, you would have to be Superman to out-breathe modern pneumatic systems. The areas that users now look to are ergonomics, duration, integration, information systems etc**

Harnesses have changed to be much more flame resistant, being manufactured from Kevlar or similar material. When designing an apparatus there is now also more emphasis on materials that will be resistant to the substances used in a CBRN attack.

So where does the future of breathing apparatus lie? Performance wise; modern BA sets easily perform well above the necessary level required to support the fire fighter, you would have to be Superman to out-breathe modern pneumatic systems. The areas that users now look to are ergonomics, duration, integration, information systems etc.

### **Ergonomics**

The ergonomics of the set, which includes weight, have become much more important within users specifications. Reducing the physical burden of the fire fighters is a key aim. Diversity issues also need to be catered for in the modern day fire service so having a set that will fit a wide range of body shapes is also important. Modern manufacturing techniques and advances in material sciences have opened up many more options to BA set designers and have enabled some innovative solutions to be introduced. Lighter sets more accurately shaped to the users body are now

pressures are already utilised in gas tanks for cars) although this of course has implications on the pneumatics of the set. Another option could be the integration of powered air systems with automatic switching mechanisms which allow filtered air from the atmosphere to be breathed when possible and saving cylinder air for when really needed.

### **Integration**

Integration with other types of products is also possible, for example integration of BA sets with hoods to cater for wearers that may have beards, integration of BA sets and powered air systems that could increase the duration of sets as mentioned above. Further down the line there could be more integration of BA systems into users turnout gear, their Gas tight suits or fire helmets.

### **Communication**

Ability to communicate during an incident is a key requirement of the fire-fighter and improvement in this area is always required. Mask design has improved with the utilisation of superior materials giving greatly improved speech diaphragms, voice amplifiers and communications devices that can be integrated onto and into the mask have also provided improvements.



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In the future digital processing to remove background noise and mapping of facemask acoustics will all lead to improvements in the quality of transmitted speech, whilst wireless interfaces and modular systems allowing selection of different solutions for different applications will improve the flexibility of the communication solutions provided to the fire services.

#### **Information systems**

Over the last few years the introduction of integrated BA electronics and information systems

**As is with a lot of new technology, development is an expensive process and manufacturing volumes are not necessarily high and this is reflected in the cost of the some of the equipment to the end user, this is in stark contrast to ever tighter budgets that have to be adhered to by the fire services**

has taken place, giving the fire-fighter extra information that may be useful to them. There has also been made available the ability to transfer the data via telemetry to a base station. The base station can provide the officer in charge or breathing apparatus controller critical information enabling him to make informed decisions on the fire ground or at an incident command post. There has been a slow uptake on this type of system possible due to the complication of the systems and possibly down to the high price this type of technology has to be sold at.

There is an enormous possibility of things that can be done with modern day electronics sensor technology and processing power and the future of telemetry information systems could involve team coordination, controlling crews, communication, 3D mapping, and visualisation of crews moving through an incident. However all are ultimately guided by their cost to the user and if they can be made robust and simple enough to be operated efficiently is in the pressurised environment of the fire ground.

Powering these devices and battery management is now a huge issue for fire brigades and one of the major challenges for manufacturers is finding suitable battery technology or alternative power sources that perform in the fire fighter's environment, are economical viable for the services and do not provide disposal problems.

**The base station can provide the officer in charge or breathing apparatus controller critical information enabling him to make informed decisions on the fire ground or at an incident command post**

#### **Conclusion**

The primary purpose of breathing apparatus and other types of respiratory protective equipment used in the fire service is clear – "to offer respiratory protection to the user and allow access to irrespirable or contaminated atmospheres for rescue and fire fighting procedures".

Although fire fighters of today have never been better protected against the external environment in terms of respiratory protection, there is always a drive to push things forward and the introduction of new technology, including telemetry systems on

SCBA is a method of achieving this.

As is with a lot of new technology, development is an expensive process and manufacturing volumes are not necessarily high and this is reflected in the cost of the some of the equipment to the end user, this is in stark contrast to ever tighter budgets that have to be adhered to by the fire services.

The key thing for manufacturers to work on is making the technology both relevant and affordable and this requires the fire services to be realistic about what features are wanted and what they can afford to pay for. It is very possible for manufacturers to design a system with all the features that ever be thought of however if this makes a single BA set cost £5000 it would of course never sell!.

It is important to remember that respiratory protection is the primary function of the RPE and whilst it is not suggested for a minute that fire brigades shouldn't utilise the latest technology to the fullest, careful consideration to what features are relevant to the roles that are being carried out by them should be given to ensure that the technologies that are purchased are the right ones for them and they achieve value for money.

With the pace of innovation in various areas of engineering being as it is currently, new possibilities for design are opening up all the time, therefore over the next 3, 5 and 10 years there should be many interesting developments in our field so the final message has to be watch this space!

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# Foams – asking the right questions, making the right choices

While the petrochemical industry is undeniably one of the major users of fixed foam fire protection systems, it is essential to have a detailed understanding of the particular installation, the risks and processes before deciding on the most appropriate solution. Here, John Allen, EMEA Marketing Director for Tyco Fire Suppression & Building Products looks at some of the issues affecting system design and overviews the merits of different fire protection strategies and the foam agents currently available.

**By John Allen,**

EMEA Marketing  
Director for Tyco Fire  
Suppression & Building  
Products

No one would dispute that the petrochemical industry constantly faces an unrivalled fire safety challenge; the processing, storage and transportation of large quantities of highly flammable and combustible liquids. While they are infrequent, large storage tank fires are, understandably, headline news and challenge all but the most professional and experienced fire fighting specialists. The cost of lost production has the potential to run into billions of dollars, and the life-threatening consequences are very real. However, risks can be minimised through the careful design of the fire protection systems, provided that this is based on a detailed and current risk assessment.

Indeed, it is an industry where the need for professionally undertaken and constantly updated

risk assessment is of paramount importance. It has to address some tough questions. What is the worst possible fire scenario; what resources would be needed to fight such a blaze; what if the fixed installations are destroyed by explosion; what sort of response would the local municipal fire service be able to provide, and how long would it take to be in place?

Certainly, the fire risk assessment should never be downgraded to the status of an occasional paperwork exercise. Risk assessment in this sector in particular must be a dynamic process and be top of the agenda, particularly when considering changes to the facilities or processes. These changes will often alter the facility's risk profiles, and this might well jeopardise the effectiveness of existing fire protection systems that, by their very

nature, must be risk specific.

And it must be remembered that, in the UK for example, the Regulatory Reform (Fire Safety) Order and the Fire & Rescue Services Act placed a whole new raft of fire safety responsibilities directly on the site owner's and occupier's shoulders. Under the Order, the onus for carrying out fire safety assessments passed from the local municipal fire brigade to the premises manager, who has the legal obligation to ensure that competent people – either employees or sub-contracted specialist risk assessors – undertake fire risk assessments of their facilities.

### Holistic approach to petrochemical fire safety

While outside the scope of this article, it is important to recognise that, in addition to commissioning a well-conceived fire fighting system, risks can be minimised by adhering to appropriate design guidelines at the facility's construction stage. For example, well-designed and built storage tanks that are correctly installed and well-maintained are essential; so too is the proper use of containment techniques and the adoption of suitable passive fire protection measures.

This care and attention to fire safety detail applies to refineries and processing areas; flammable and combustible liquid storage areas, including tanks and warehousing; bund and dyke areas; vehicle loading facilities and jetties. Inevitably, such a diverse collection of fire risks calls for a comprehensive toolbox of products;

foam agents and design expertise to create an optimum fire protection solution for the entire facility.

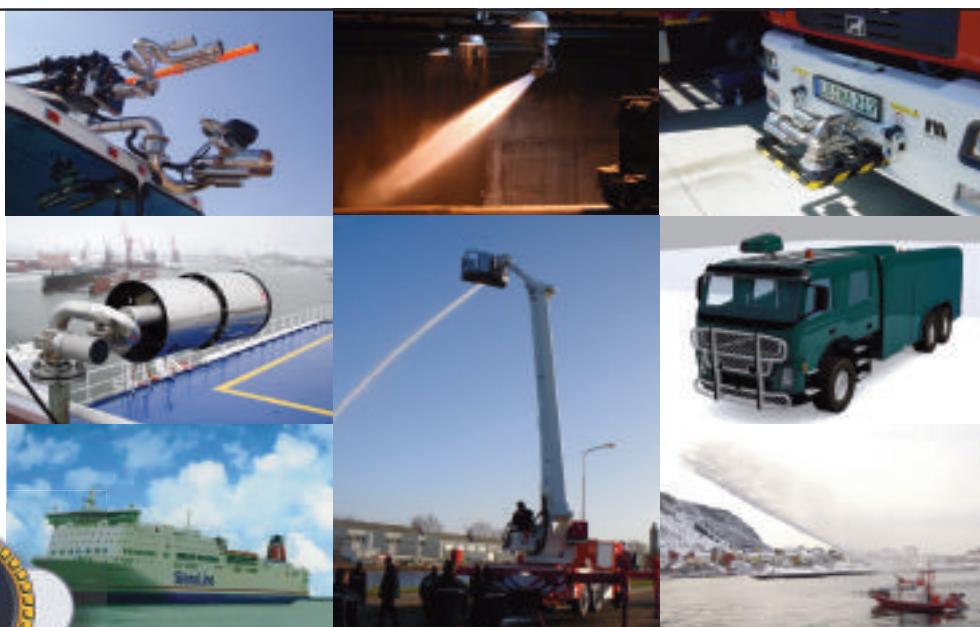
The design of fire protection systems requires specific expertise and experience in identifying the risks associated with hazardous materials and processes. Each application may well warrant a different fire protection solution, depending on the type of liquid stored or processed. So, the system's designer must consider the liquid's flash point, its boiling point, and determine if it is a hydrocarbon or a water-soluble, polar solvent fuel. This information enables the designer to complete the first part of the design process, classify the liquid, and establishes the most appropriate type of foam concentrate, its application rate and the discharge time.

To assist the designer, the NFPA [National Fire Protection Association] has developed a taxonomy for flammable and combustible liquids, which assists in developing appropriate fire protection tactics. For example, volatile liquids have a high vapour pressure and are easy to ignite, while products with a high vapour pressure and low flash point are more difficult to extinguish than products with a low vapour pressure and high flash point.

### Firefighting foam options

There have, in recent years, been many advances in the field of foam concentrates, and some suppliers have been somewhat over enthusiastic when promoting their own type of generic

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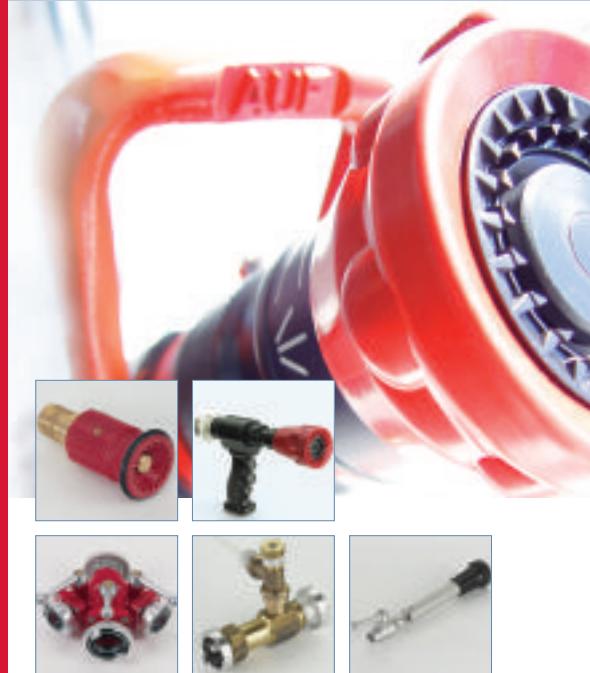
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product, the formulation of which has been dependent upon the company's manufacturing capability. However, it is important to be aware of the wide range of foams that are available today, from low-cost but highly stable protein foams through to the latest leading-edge synthetic products, such as ANSUL® THUNDERSTORM® ATC 1 x 3. This is the latest generation of alcohol resistant AFFF foam concentrate, which was developed in consultation with Williams Fire and Hazard Control Inc, probably the world's most highly respected specialist in the fire protection of flammable liquids.

Basically, foam is a stable mass of small, air-filled bubbles that have a lower density than oil, petrol, or water. When it is discharged, it comprises three elements: the foam concentrate, water and air. Because of the product's low density, it readily floats on a fuel's surface to extinguish a flammable liquid fire by separating the fuel from oxygen. Effectively, it smothers the fire, while its high water content provides effective cooling. Well-formulated foam, correctly applied, will exhibit a number of characteristics. These include stability, cohesion, rapid fire-knockdown, heat resistance and vapour suppression; all of which will ensure that a fire is extinguished efficiently and securely to prevent re-ignition.

Briefly, the types of foam currently on the market can be generally summarised as follows:

### Protein Foams:

- Stable mechanical foam
- Good expansion properties
- Excellent heat and burn-back resistance
- High fluidity
- Low fuel tolerance

### Fluoroprotein Foams:

- Inherent stability of protein base
- Faster flame knock-down
- Fuel tolerance
- Greater fluidity
- Hydrocarbon vapour suppression

### Aqueous Film Forming Foams (AFFF):

- High quality foam
- Low or medium expansion
- Compatible with wide range of equipment
- Good shelf life
- Concentrated agents available for 1% induction

### Film Forming Fluoroprotein Foams:

- High stability foam
- Rapid knock-down

### Alcohol Resistant Concentrates:

- Synthetic or fluoroprotein
- Highly versatile
- Fast knock-down
- Good burn-back resistance
- Fuel tolerant (used on hydrocarbon and polar solvents)
- Excellent prolonged vapour-mitigating properties

Of course, it is not merely a matter of selecting the foam, critically important though that is; it is equally essential to decide on a supplier of foam concentrate and provider of delivery systems. And this must be a decision that is not based



on cost alone! Continuity of supply, technical support, engineering know-how, manufacturing resources and industry expertise all have to be assessed.

### Petrochemical industry applications

The petrochemical industry uses a variety of storage tanks for its products, each with a slightly different risk profile:

- Cone roof tanks (fixed roof tanks).
- Open-top floating roof tanks.
- Covered floating roof tanks.
- Horizontal tanks.

Usually, the primary protection of tanks is by means of fixed fire protection systems, with secondary protection being achieved through the use of foam monitors. Foam generators used in fixed systems have proved very successful in many installations and can provide a cost effective and reliable solution. However, any damage to the tank structure may well limit the foam generator's efficiency. This, together with maintenance issues, has lead to the widespread use of sub-surface injection systems in applications where sufficient water pressure is available for their use.

Sub-surface injection of foam into a storage tank is, as the name implies, where the foam is injected into the bottom of a tank, and then floats to the surface to spread and extinguish a fire. However, this method is unsuitable for use with polar solvents, even where alcohol-resistant concentrates are used, because the fuel destroys the foam. So extreme care must be taken to ensure that the sub-surface injection technique is not used on potential gasoline blends that contain alcohol or other polar solvent additives as oxygenates.

Sub-surface injection also cannot be used on any open-top floating roof tanks or cone roof tanks, in accordance with NFPA 11 [*Standard for low, medium and high-expansion foams*]. However, the so-called semi-subsurface injection technique has all of the benefits of sub-surface injection, plus it can be used for all types of fuel. The semi-subsurface technique uses a flexible hose, which floats to the surface when the system is activated, to deliver the foam onto the surface.

Fixed monitors are a cost effective method of protecting relatively small storage tanks and

associated spill or ground fires. Remote operation, which ensures that fire fighters are kept at a safe distance from the incident, can be achieved by using electrical or hydraulic control systems. Although monitor's streams have successfully been used for extinguishing fires in larger diameter tanks, using high-flow devices and large diameter fire hoses, monitors should not – in accordance with NFPA 11 – be considered as primary protection for larger cone roof tanks with diameters in excess 18 metres.

Fixed systems can also be used for floating roof tanks; foam pourers are used to protect the rim seal area, with the foam being contained by a dam. However, good foam fluidity is essential to ensure that rapid coverage is achieved, and some oil companies have adopted a belt-and-braces approach and installed both foam pourers and sub-surface systems on covered floating roof tanks.

Horizontal tanks have been known to rupture following an explosion, so it is necessary to ensure that the bund area is adequately protected. Fixed low or medium expansion generators can be used to create an effective foam blanket, even on larger bund areas in major tank farms, and any residual fuel in the tank can be protected using a monitor. In reality, monitors can be used to protect the bund area, but this results in much higher foam consumption. At least two monitors are recommended to protect larger bunds to ensure full coverage and access to devices under all wind conditions.

Truck loading racks require special attention as a fire in this location can easily escalate and threaten lives. Foam can provide a quick knock-down with the added advantage of vapour suppression and containment to prevent re-ignition prior to the cleaning-up process. Foam is delivered through a combination of an overhead foam/water deluge sprinklers supplemented by low-level ground sweep nozzles. Additional protection is provided against radiant heat, and structural cooling is beneficial to prevent further damage. Monitors can provide cost effective protection, but coverage remains an issue and the designer must be certain that this strategy will deliver the site's fire protection objectives.

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# Chemguard Introduces New Short-Chain\* Fluorosurfactant for Fire-Fighting Foams

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Chemicals Division Sales and Marketing Senior Manager Bob Gilbert points out. "In addition, the surface tension efficiency of FS-157 may allow for lower concentrations than with 1157."

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For more information contact Bob Gilbert, Senior Manager, Sales & Marketing, Specialty Chemicals Division, 1.817-473-9964 x211, [bgilbert@chemguard.com](mailto:bgilbert@chemguard.com)

\*Short-chain products contain six or fewer fluorinated carbons.



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SOLBERG SCANDINAVIAN is an innovative, forward thinking, foam manufacturer that is very aware of its environmental responsibilities and following an intensive program of Research and Development, is now able to produce high quality organohalogen/fluorosurfactants free foams. These new "state of the art" foams, called Solberg Re-healing Foams, have passed all recognised fire standards and approvals including EN 1568, ICAO (level 'B') and Lastfire (on all three nozzles, fresh and sea water).



Solberg Re-healing Foams, are manufactured at its factories in Norway and Australia and are proven to extinguish the toughest of fires yet are certified by the Hygiene Institute in Germany as being totally safe in our environment and is even placed in 'Water Hazardous' Class '1', the lowest and safest.

This new environmentally benign foam joins a long list of high quality foam products available from Solberg Scandinavian. Fire Fighting Foams include our AFFF brand 'Arctic Foam' at 1%, 3%, 6%, along with alcohol resistant type foams which include a 1x3% ATC (Alcohol Type Concentrate), 3x3% ATC and 3x6% ATC, freeze or non-freeze protected. Furthermore the environmentally benign foam, 'Solberg

Re-healing Foam', comes as 3%, 6% or 3x6% ATC. Finally there is a Training Foam, High Expansion Foam, Dust suppressing Foam and Concrete Foam. Solberg Scandinavian are "The Foam Experts".

When considering a fire fighters ability to safely and effectively extinguish a flammable liquid fire, it is obvious training is crucial; however current environment legislation restricts training due to potential harm done to the environment. Using an "Environmentally benign" foam such as Solberg Re-healing, is the solution, it negates the need for two types of foam and allows fire fighters to drill with 'frontline' foam. Trained Fire-fighters are more able to quickly extinguish a fire, use

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The introduction of Bio-Fuels and Ethanol has highlighted a new 'problem' for fire-fighting foams and as a consequence Solberg Scandinavian undertook a series of tests using bio-fuels from E15 up to E95 to determine the fire performance of Solberg Foams. This data is available on request. Needless to say it is proven that Solberg Foams will successfully extinguish Bio-fuels without any need to change flow or application rates. Furthermore Solberg RF 3x6ATC has been proven to extinguish Isopropanol (IPA).

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trates since the 1920's. Our extensive product range includes Sthamex AFFF 1, 3 and 6%, Moussol APS Alcohol Resistant AFFF 1x1, 3x3 and 3x6%, Moussol APS LV (Low Viscosity) Alcohol Resistant AFFF 1x1, 1x3 and 3x3%, Foamousse Protein Foam 3 and 6%, Fluoro-Protein Foam 3 and 6%, FFFF 3% and 6% & FPPP-AR 3x6% foam concentrates, as well as specialist foams developed in partnership with our customers for special applications.

In the 21st century the challenges of fire protection continue to grow and change. The focus is not just on the performance of fire extinguishing agents but equally on responsible solutions which are acceptable to both the environment and society. The prevention of and response to fire is a sensitive and complex task. Particularly, in the industrial sector this needs to be met with a sophisticated range of well-engineered Fire Fighting Foam products and delivery systems capable of meeting the high volume water capacities required to extinguish any risk.

Our latest developments include our Moussol APS LV 1x1, a revolutionary Alcohol Resistant AFFF (AR-AFFF) with an induction ratio of 1% for Hydrocarbons and also only 1% Alcohols/polar solvents, with a viscosity in line with traditional AFFF foams.

Unlike conventional Alcohol resistant foams ours does not include a polysaccharide based polymer film builder (required to minimise the water absorption from the foam bubbles) which gives the foam a high viscosity and therefore, makes it difficult to pump in low temperatures.

At recent fire tests at the BEST Academy in Beaumont, Texas, we successfully and easily extinguished Ethanol E85 (85% Ethanol and 15% unleaded gasoline) fires.

**For more information on our products and services please contact us as follows:**

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**Jan Knappert**

**International Sales Director**

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# Williams Fire & Hazard Control

WILLIAMS FIRE & HAZARD CONTROL, having seen many of the most dramatic Industrial Fire emergencies on record, has long been an aggressive proponent of applying the most effective tools possible to their craft of flammable liquid fire response as they face potentially deadly scenarios as part of their calling.

This posture has led them to develop specialized equipment when it was unavailable in the marketplace – equipment that has shaped the field of flammable liquid fire response for nearly 30 years. Self-educting nozzles, master stream equipment, Hydro-Foam and Hydro-Chem tech-

nology, large volume water-foam application systems, and foam chemistry itself are all part of the direct influence Williams Fire & Hazard Control has had on the Industrial Firefighting industry.

All firefighters obviously want to be safe. When you push the odds as we have by facing multiple fire scenarios dozens and dozens of times, you begin to temp fate. Therefore, we are constantly developing our tools and tactics to address ...

- Safety
- Effectiveness
- Adaptability
- Logistics
- Simplicity

## Moussol APS LV 1x1 Extinguishes Ethanol E85 Fires easily.

# FOAM FIGHTS FIRE

**David White, President of  
Fire Safety Specialists Inc.  
commented  
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## FOAMS ROUND UP

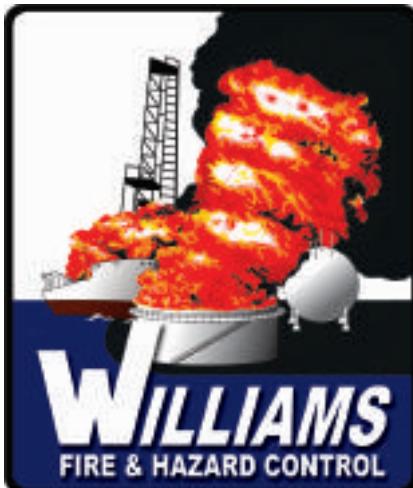
When you choose to step forward when others turn back, when you volunteer to face these extremely hazardous situations wherever and whenever they occur – not perhaps once or twice in a career but in hundreds of cases – you want the best possible weapons available to survive the battle. We have faced nearly 200 very dangerous large-scale fire related situations, and we have always looked for the best possible tactics, equipment, and foam to help us survive.

ThunderStorm Foams are a direct example of these philosophies. When 3M ceased producing extinguishing agents, Williams Fire & Hazard Control literally searched the world over for the most effective foam chemistry available. Before their withdrawal, 3M was making the most effective foam we had tested. When they withdrew, it allowed us an opportunity to try and surpass their LightWater characteristics with new foam blends and chemistry that would allow us even greater impact in our response applications – but also greater efficiencies. As we narrowed our search to finally work with ANSUL, we successfully created a foam with even greater sealing and healing capabilities AND the efficiency of a 1% foam! This had been unseen before ThunderStorm 1%!

Adding foams to your response logistics effects so many factors in an Industrial Fire response – especially when working in the tight spaces found in so many facilities. ThunderStorm 1% foam blend provides superior effectiveness, while allowing great advances in field logistics from the aspect of manpower, staging, application rates, storage, etc.

In retrospect, this constant mission for the most effective means to do our job has allowed us not only to survive, but to claim victory in many doubtful situations, and to bring the best possible tools of our trade to market to help our peers survive as well.

The ThunderStorm line of foam products include AR-AFFF foam blends found to be most effective in applications for both hydrocarbons



and polar solvent related fires as well as AFFF foams, and a structural SFFF blend primarily for the municipal market.

### ThunderStorm® ATC AR/AFFF

ThunderStorm® ATC 1 x 3 Alcohol Resistant AFFF Concentrate is formulated using a new and proprietary technology. The foam concentrate has a dramatically reduced viscosity as compared to many other listed polar solvent type AFFF concentrates on the market. This reduced viscosity enhances performance in all types of foam proportioning equipment including in-line eductors, balanced pressure systems, and built-in systems aboard CFR vehicles.

Additionally, the fire fighting performance of ThunderStorm® ATC is superior to other AR/AFFF foam concentrates. ThunderStorm® ATC 1 x 3 Concentrate offers many distinct advantages including ease of use and represents a continued commitment to quality by improving the fire performance of this type of agent on gasoline products while still maintaining high performance levels on other hydrocarbons as well as polar fuels.

ThunderStorm® ATC 1 x 3 Concentrate is formulated from special fluorochemical and hydrocarbon surfactants, high molecular weight polymers and solvents. It is transported and stored as a concentrate to provide ease of use and considerable savings in weight and volume. It contains no PFOS or PFOA and is biodegradable. It is intended for use as a 1% proportioned solution on hydrocarbon fuels at .10 minimum application density, and as a 3% proportioned solution on polar fuels at .13 minimum application density in fresh, salt or hard water. It may also be stored and used as a premixed solution in fresh potable water.

There are three fire extinguishing mechanisms in effect when using ThunderStorm® ATC 1 x 3 solution on either a conventional Class B hydrocarbon fuel such as gasoline, diesel fuel, etc., or a Class B polar solvent (water miscible fuel) such as methyl alcohol, acetone, etc. First, an aqueous film is formed in the case of a conventional hydrocarbon fuel, or a polymeric membrane in the case of a polar solvent fuel. This film or membrane forms a barrier to help prevent the release of fuel vapor. Second, regardless of the fuel type, a foam blanket is formed which excludes oxygen and from which drains the liquids that form the film or the polymeric membrane. Third, the water content of the foam produces a cooling effect on product and steel. It also penetrates as a wetting agent on class A fires.

### Proportioning

ThunderStorm® ATC 1 x 3 Alcohol Resistant Concentrate can be easily proportioned (at the correct dilution) using most conventional proportioning equipment such as:

- 1 Hydro-Foam™ Nozzles
- 2 Balanced pressure and in-line balanced pressure pump proportioning equipment.
- 3 Balanced pressure bladder tank proportioners
- 4 Around-the-pump and Through-the-pump proportioners
- 5 Fixed or portable (in-line) venturi proportioners
- 6 Handline nozzles with fixed induction/pickup tubes

### Typical Physiochemical Properties at 77°F/25°C

Appearance	Purple Gelled Liquid
Density	1.02 ± 0.01 g/ml
pH	7.5 – 8.5
Refractive Index	1.3600 ± 0.0015
Viscosity	2700 ± 500 CPS*
Spreading Coefficient	4.0 – 6.0
*BROOKFIELD VISCOMETER	Spindle #4, Speed 30 RPM

### Options:

- 1% x 3% concentrate
- 3% x 3% concentrate
- 3% x 6% concentrate
- 1% x 6% Freeze protected
- ½% for Crude Loading Stations

# National Foam

NATIONAL FOAM, part of the Kidde Fire Fighting organization, is a manufacturer of Foam Concentrate, Foam Proportioning Systems, Fixed and Portable Foam Fire Fighting Equipment, Monitors, Nozzles, and Specialized Big Flow Pumping Solutions. National Foam has historically been at the forefront of foam fire fighting and fire control technology and is the acknowledged world leader in providing foam based solutions. Other brands associated with National Foam include; Feecon, offering airport crash rescue and general mobile fire fighting equipment. Our range of foam concentrates consist of:

- Aqueous Film Forming Foam (AFFF)
- Alcohol Resistant Aqueous Film Forming Foam (AR-AFFF)
- Protein Foam
- Fluoroprotein Foam

- Coast Guard Approved Foam
- Military Spec. Foam
- Class A Foam
- High Expansion Foam
- Long Duration Foam
- Vapor Suppression Foam
- Cold Foam
- Wetting Agents
- Training Foams

We also offer a foam testing service.

For more information about our company please contact:

**Kidde Fire Fighting National Foam**

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Fax: +1 610 524 9073

Website: [www.kidde-fire.com](http://www.kidde-fire.com)

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# IVECO MAGIRUS supplies giant multi-purpose fire-fighting vehicle to Evonik Stockhausen GmbH

In spring 2008, IVECO MAGIRUS delivered another unusual and multi-purpose tank pumper: the HTLF 40/40-5-250-100 was specially designed and produced to meet the needs of the Evonik (previously known as Degussa) company fire-brigade for its Stockhausen site (Rheinland-Pfalz/Germany). The giant universal fire-fighting vehicle considerably increases the safety levels at the chemical plant.

The universal emergency service fire-fighting vehicle is mounted on an IVECO Stralis AD 260 S 36 Y/PS 3-axle chassis and has a 1+8 seating arrangement. All seats in the "Integrale" crew compartment module (3+4) are equipped with compressed air breathing apparatus. With 264 kW (360 HP), the giant vehicle – with its 26-ton permissible total weight – is powered by its IVECO cursor engine to reach a top speed of 100 km/h. The vehicle has dimensions of 12,000 x 2,500 x 3,600 mm and a wheel base of 5,700 mm/1,380 mm.

As the 40/40-5-250-100 description already suggests, the pump's effective output is 4,000 litres/min. at 10 bar; the water tank has a capacity of 4,000 litres, the foam compound tank holds 500 litres and a powder extinguishing system with 250 kg powder extinguishing agent. As a special feature, the vehicle carries an additional 100 litres of Firesorb® fire retardant gel – an Evonik development. The extinguishing media additive for category A fires, chemically-speaking a liquid polymer preparation, forms an adherent and heat-protecting gel which can be used for fire fighting and protecting buildings and industrial plant against fire. The foam concentrate and Firesorb® are mixed using a MAGIRUS FireDos FD 2500 or FD 1000 device. In accordance with its operational profile (among other things, chemical/tank accidents), the fire-fighting giant also has a nitrogen extinguishing installation with a 600-litre capacity on board which can also be fed into stationary fire extinguishing systems. With this, up to 120 m<sup>2</sup> gaseous nitrogen-based extinguishing agent can be produced.



Other features of the vehicle include:

- Electrically-operated ladder removal device for scaling and sliding ladders
- Light mast 2 x 1,000 W
- Roof monitor 2,000 l/min
- Extensive range of on-board equipment e.g. chemical protection suits
- Rear view camera

The Evonik plant in Krefeld with the Evonik Stockhausen GmbH is a so-called "multi-user site", i.e. a site whose infrastructure is shared by several business units. A workforce of around 1,000 is employed here.

The Evonik Stockhausen GmbH company fire brigade consists of nine

professional and twelve voluntary fire fighters. The brigade collaborates closely with the local town's own fire fighting service and the company fire-brigade of the neighbouring Bayer AG, and its vehicle fleet – including the new IVECO MAGIRUS HTLF 40/40-5-250-100 giant – now numbers six special vehicles that can be used for a range of different fire fighting and environmental protection tasks.

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## IVECO MAGIRUS supplies 45 special rescue vehicles to Turkey

The order books of IVECO MAGIRUS Brand-schutztechnik GmbH are full. Currently, the company has one particular order that is being shipped which is, in several respects, quite extraordinary – exceptional not only regarding the scale of the delivery but also with regard to the type of vehicle which was ordered. It concerns 45 highly mobile multi-purpose vehicles for heavy duty rescue operations, which are also described more informally as "rescue vehicle with crane". The entire fleet will be stationed in and around Istanbul, Turkey.

The basis for the special vehicle is provided by a customized off-road chassis supplied by the American manufacturer, GPV (General Purpose

Vehicles), which was assembled using different components according to the customer's requirements. The chassis with the drive configuration 6x6x6 have each a gross vehicle weight of 27,000 kg and is driven by a Caterpillar engine with 298 KW/400 hp. Power transmissions to the three axles is carried out by means of a ZF Ecomat 6-gear gearbox. All three axles are steer able which means the vehicle is extremely manoeuvrable.

Through a levelling mechanism in the axle springs, the chassis can adapt to lateral and longitudinal inclinations of the ground. The driver's cab has been constructed using aluminium sheet technology and is designed for one



driver and two crew members. For the superstructure, IVECO MAGIRUS has used

the thousand fold tried and tested AluFire construction. Because the body is elastically mounted on the all-wheel chassis, the roller shutters on the equipment lockers can also be opened also on extremely rough ground conditions without any problems.

The six equipment compartments provide generously-space storage room for the fire-fighting gear which is in principle based on the loading set-up of a RW rescue vehicle. For tasks involved in technically-difficult rescue operations, additional lifting gear, hydraulic spreaders and cutting tools are on board. If searching for buried persons, e.g. after an earthquake, the vehicles are equipped with several specially designed detecting devices.

A hydraulically-driven winch with 75 m cable length and 58 kN tractive powers is installed in the chassis. The power generator is driven from the chassis and supplies 23 kVA. A crane is mounted at the rear of the vehicle and has a

reach of 12 metres.

Delivery of the 45 vehicles started in February and will be completed in summer 2008.

With the realisation of this very special and sophisticated vehicle design, IVECO MAGIRUS has once again proven its capability and technological expertise which go far beyond just standard and serial solutions.

If you have any questions or require further information, please contact Alfred Bidlingmaier  
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# IVECO MAGIRUS

## South Africa receives nine ROSENBAUER ARFF vehicles

The ROSENBAUER Group, a leading manufacturer of special airport fire fighting vehicles, recently handed over nine ARFFs to the South African airport operator, ACSA (Airports Company South Africa). The consignment consisted of six BUFFALO series vehicles and three newly designed PANTHER 8x8s on MAN chassis. These modern vehicles are to be stationed at South Africa's largest airports and are part of a long-term ACSA purchasing program, which has the aim of bringing its infrastructure and safety systems up to the highest standard in time for the World Football Championships in 2010. ACSA handles some 98% of the nation's commercial air traffic and operates South Africa's most important airports such as Durban, Cape Town and Johannesburg. The latter handles 17.3 million passengers annually (Cape Town: 7.3 million) and is by far the busiest airport in the country (by comparison: Vienna Airport: 18.8 million passengers).

At its ten airports, ACSA disposes over a fleet of 36 large fire-fighting vehicles and on the basis of this new purchase it will be possible to shorten their average periods of use from 12 to 8 years.

### Six Supreme BUFFALO ARFFs

The Supreme BUFFALO are built on a 630 hp, 6x6 all-wheel drive MAN chassis.



A top speed of around 130 kph is available and the vehicles accelerate from 0-80 kph in 25 seconds.

In addition to attack times, the most important requirement for every ARFF is pump and roll operation. ROSENBAUER provides this feature by means of a Chelsea 852 auxiliary engine. The extinguishing agent pump (R600) with an output of 6,000 l/min at 10 bar is powered by the main engine and through this system, the available engine power is split between driving and extinguishing.

The R600 operates in tandem with the RVMA 500 automatic foam proportioning system, which is precisely matched to the pump and integrated into the pump unit. The Supreme BUFFALOS are also fitted with the RM 60E, the top model in the ROSENBAUER monitor range, and a front monitor.

### PANTHER - the ARFF top model

The three PANTHER 8x8s supplied were also built on and MAN chassis. They are powered by a 1,000 hp diesel engine with automatic Allison transmission. The vehicles can accelerate from 0-80 kph in under 25 seconds and have a top speed of 140 kph.

The PANTHERS have two separate engines for the chassis and the extinguishing pump, which facilitate simultaneous, full extinguishing performance in tandem with maximum speed. In combination with the ROSENBAUER N100 normal pressure pump, the DEUTZ pump engine provides extinguishing performance of up to 9,000 l/min at 10 bar, whereby the extinguishing agent payload, consisting of 11,000 l of water and 1,500 l of foam concentrate, can be sprayed for up to 90m in around 75 seconds. Two of the South African PANTHERS are equipped with a HRET (High Reach Extendable Turret) and one with the electronically controlled RM60E monitor.

The decisive factors in the capture of this ARFF order included the comprehensive training of the crews, to enable them to operate these sophisticated vehicles in an optimum manner. In addition to familiarization with modern ROSENBAUER technology, this training also covered intensive and comprehensive instruction in the use of the extinguishing systems and driving techniques.

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 **Rosenbauer**

# New ARFF-Fleet at Hamburg International Airport: **ZIEGLER Z 8**



Hamburg International Airport is presently reorganizing its ARFF-Fleet and the decision was to use ZIEGLER Z 8s. The first unit of four is now in service.

**ZIEGLER Z 8 is based on the most modern technology and offers tailor-made solutions for all kinds of airports. New: total height with embedded 20 m Snozzle telescopic boom now only 3.800 mm.**



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## Do you have enough water at the scene?

In the haste of complying to the ICAO category requirements, many airports seem to overlook the issue of sufficient water at the scene, and in reading the requirements for each category, ICAO actually stipulates the need to have sufficient foam for first attack and a refill of the water tank.



But, in most cases to refill the water tank means going back to the station or a nearby hydrant.

Changi Airport however, has thought through this "second load" and is operating nurse trucks to fulfil the need.

The additional water is essential when considering major incident cases where far more water was used than is stipulated to carry on the appliance.

The Buffalo units supplied to CAAS have the ability to not only back up the front line crash tenders, but can also be used as a standby when maintenance is ongoing for the main trucks, and are even required to feed the water lines on the Aircraft Escape Stairs.

The unit can also be used for domestic fire fighting duties at the airport.

The trucks operating at Changi airport are built on specially prepared Scania R480 chassis (Euro IV), with R28 crewcab, and mounted with a 12,000 litre water tank, 960 litre foam tank, a Rosenbauer R600 pump and Foamatic RTP foam system. A front mounted winch is also installed.

With a top speed of over 100 kph and acceleration to 80kph in 30 secs, the performance is equal to a normal crash tender.

This capacity mimics the tank capacity on the Changi 8x8 trucks which form the front line attack, and with equal performance, they can therefore fulfil the "second load" requirements.

Other brigades also operate the same style of truck as a front line machine, and 2 obvious cases come to mind are, Arlanda in Sweden, and Suvarnabhumi in Thailand.

In cases where smaller airports are working on smaller budgets, such appliances offer a practical alternative to the full crash tender, whilst preserving the basics of responding to an incident.

### For more information contact:

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Website: www.skfire.com

## Z8 - The ZIEGLER Flagship continues its Course of Success

The crash fire rescue vehicle Z8 of ALBERT ZIEGLER GMBH & CO. KG, Giengen/Brenz, continues its history of success. Since the first vehicle of this category was supplied more than 25 years ago ZIEGLER is handling more projects than ever. Among others are the recent deliveries: 16 units for the German Armed Forces, 1 unit for Airport Zagreb, 8 units for Turkey, 1 unit for Brussels, 3 units for Munich Airport. 4 units for Hamburg Airport will be delivered within the next few weeks. With these orders Ziegler prove again that the leading suppliers of the German fire brigades also find high acceptance in the tough international competition even in the king's class.

The Z 8 complies with and exceeds the ICAO-Recommendations.

As a basis for this crash rescue fire vehicle a MAN 8x8 chassis with single tires, MAN-V-12 Diesel engine with 735 kW (1.000 HP) is used. The vehicle with a total weight of 43.000 kg is suitable for interventions on off road terrain and it stands out due to extreme high driving performance. Maximum speed is approx. 140 km/h; for acceleration to 80 km/h less than 25 seconds are needed.

The Ziegler pump with a nominal output of 10.000 l/min at 10 bar is driven by a separate pump engine with 360 kW (480 HP).

Further components are a water tank with of 12,500 l, a foam tank of up to 1,500 l/min; on request a powder unit or a CO<sub>2</sub> unit can be mounted. Output of the extinguishing agent is either made through the roof turret (appr. 6,000 l/min), or the bumper turret. Optionally a telescopic boom with nozzle and piercing unit is available which is designed for the NLAs coming into traffic now.

The vehicle superstructure consists of driver/crew cab, pump and equipment lockers and water/foam tank. All components are mounted distortion-free on the chassis frame. Remarkable features of the superstructure in the patented ALPAS design are high flexural strength and torsion-proof. Thanks to anodizing



optimum protection against corrosion and a maximum degree of tightness and safety is reached.

The large canopy safety cabin manufactured in aluminium design provides a spacious working place with optimum view for 1+3 crew. Excellent features are protection against noise, heat and splinters and the strictly ergonomic arrangement of the control and monitoring elements.

Optional equipment: an automatic air conditioning system, heated seats cushioned pneumatically with integrated compressed-air breathing apparatus, heated outside mirrors as well as swinging doors operated pneumatically opening ahead with swivelling treads for safe and easy access, even with breathing equipment put on.

The Z 8 sets standards in the electronic features. Thanks to the cross-linkage of the electrical components by CAN-Bus all driving and control operations for the extinguishing technology can be brought together, evaluated and automated. The various parameters of the extinguishing unit are shown in graphical coloured displays. Thus, actual data are available for preparation, intervention, and for maintenance.

By these sophisticated features Ziegler provides a variety of advantages for the customers for being ready in case of emergency according to ZIEGLER's slogan: "ZIEGLER – we provide safety".

### For more information please contact:

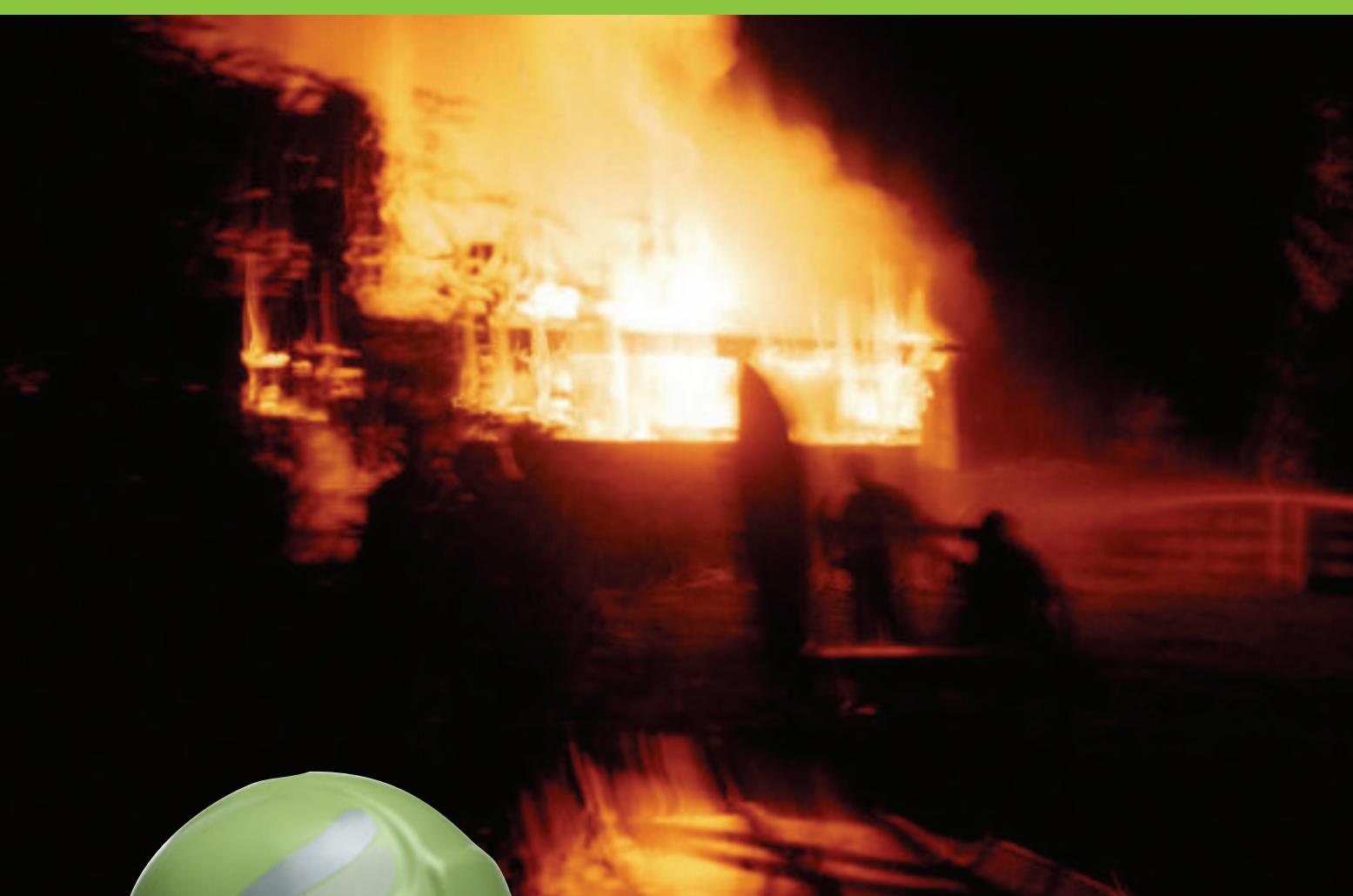
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# TRAINING



*Pic courtesy of Texas Engineering Extension Service*

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Industrial protection whenever temperatures are significantly increased (250C, 30 min)





# "Firefighters helping Firefighters"

## Recycling at its BEST

**By Ron Gruening  
and Mark Allen**

As we walked along the street Ron suddenly said "Mark, look at this." I walked back to the driveway that Ron had begun to walk up. As I walked up behind him I saw an open area with several uniformed men standing around a couple of benches. As we approached we realized that we were looking at the local fire station and its firefighters.

The station is located in the Romanian section of Chisinau, Moldova. We introduced ourselves through our Romanian interpreter and asked if we could look around. When the firefighters realized that we had served in Fire/EMS services for many years they warmed up. Ron describes it as "*firefighters are the same everywhere*". They showed us around the outside of the station house. The station is literally a garage area located under a ten story residential apartment building with a small courtyard in front of the garage doors to move vehicles around. As we moved around the yard and into the garage area we noticed that the vehicles were very old and looked as though they had outlived their usefulness a long time ago. Another man appeared and asked "*what was going on?*". It was obvious to us he was the Fire Chief, his name was Alexi. He did not look pleased that strangers were looking around. We intro-

duced ourselves to Alexi and he became friendly when he heard of our backgrounds. He then invited us into the station house and showed us all





over the building. They have a small cramped room where they bunk the firefighters and their locker room is approximately ten by fourteen and has forty lockers in it. We eventually ended up in Alexi's office and sat down to talk. He called two of his captains to come over and talk with us. We found out that the most common cause of fire in Moldova was electrical problems. The buildings they fight fires in are like fortified bunkers. They are made of thick concrete walls, and there is no place for the heat to go. As we talked they brought in some Moldovan wine and snack. They wanted to welcome us Moldovan style with a toast. The chief showed us their turnout gear as we were leaving. We were surprised at what they showed us. They held up several old rubber rain-coats with no insulation. Several helmets looked to be from World War II. They stated they shared ten air masks among eighty-five firefighter. Their hand tools were inadequate. We were looking at a very poorly equipped fire department. Alexi asked if we could possibly do something to help them. Upon

our return to the United States we began an effort called the **International Fire Relief Mission – Moldova 2007** project. The goal was to recycle used firefighting equipment back to the country of Moldova. We were able to take our need for equipment to our home areas of Minnesota and Wisconsin with the help of various firefighting associations and local radio and television media. The response from the fire service was overwhelming! We collected and shipped over \$540,000 worth of recycled equipment. To make sure the firefighters would properly use the equipment, we traveled to Moldova during the months of November and December 2007 to train them on NFPA equipment basics.

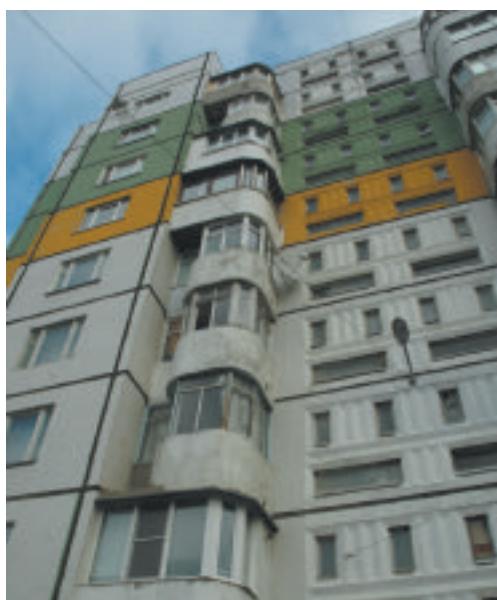
#### **That brings us to the reason we've shared our story with you**

Please allow us to introduce ourselves; we are Mark Allen and Ron Gruening. Our backgrounds extend well into the Fire/EMS arena as we are former 911 emergency Paramedics. Ron currently serves as a firefighter with the Lindstrom, Minnesota fire department in the United States.

After seeing the need for decent equipment abroad, a non-profit 501 (c) (3) humanitarian organization called the "*International Fire Relief Mission*" was founded. The goal is to collect and recycle serviceable fire and EMS gear to second and third world countries that lack critical firefighting equipment. In this region the personal protective equipment is literally a rubber rain suit with no thermal or moisture barrier systems. Head protection is limited to essentially a low quality motorcycle helmet, while protective gloves and boots are non-existent. Fire apparatus is also needed. A small village in Moldova named Streseni has one tanker and the fire crews fill the tanker with a two-gallon bucket from a well in the ground.

We train the firefighters within basic NFPA standards curriculum on the equipment we delivered. The curriculum has been translated into their native language.

Our focus is on providing firefighters less fortunate with good equipment and the basics of training,



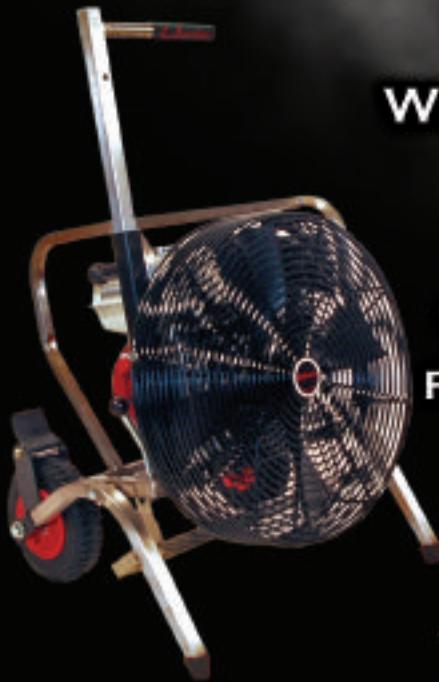
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listed: Helmets, PPE turnouts, SCBA's, Hand tools, Hoses-nozzles and Fire apparatus. Please do not send anything that is marginal or not serviceable. We are required to inspect all equipment for the customs manifest and shipping.

- Other ways to be part of our action team are through training. We always need volunteers to teach Basic Firefighting/EMS. Perhaps you cannot travel but want to help in your



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- Another way to support the International Fire Relief Mission is through financial giving. The cost to collect, deliver and train firefighters in second and third world countries can be quite large. We incur costs from shipping boxes and plastic wrap all the way to airfare for our training teams.
- If you or your department would like to become a sponsor or if there is corporation in your area that would like to be of assistance, our contact information is listed below. Thank you in advance for your willingness to partner with us on this project. **IFF**

We are proud to announce that the following corporations have partnered with us to help **"Firefighters helping Firefighters"**

 **Rosenbauer** Kevin Kirvida, President of [www.rosenbauer.com](http://www.rosenbauer.com) General Division Rosenbauer America has been a key supporter of the **IFRM** mission to recycle quality equipment to fire systems in second and third world countries. Support is ongoing through their dealer network of collection and storage of equipment.

 Northwest Airlines has been a major supporter of **IFRM** team travels within their destination network. We are looking to them to be our exclusive provider of air travel.

 **LION APPAREL** Lion Apparel, the world's largest supplier of protective clothing worn by Firefighters throughout the United States and in many parts of the world, is one of the first Companies to find value in the **IFRM** Mission. Steve Schwartz, Lion's CEO and Fourth-generation family owner, continues to support the future growth of help in Firefighters around the world. Lion Apparel is the maker of brands such as Janesville® and Body-Guard® and has been in business for more than 100 years.

 **GearGrid** GearGrid is the industry leader in the design and manufacture of durable turnout gear, hose and SCBA storage systems as well as hose drying systems. Vice President and owner Mike Boyer created the GearGrid line of products in response to demands from firefighters for a more durable open-designed system that would protect the substantial investment made in their firefighter turnout gear. Boyer and the entire staff at GearGrid proudly support the mission of **IFRM** and take great pride in our partnership.

 **FRC** Founder Jack McLoughlin founded Fire Research Corporation (FRC) in 1968. As an active volunteer firefighter, Jack recognized there was a need to help firefighters around the world. He and FRC have stepped forward and offered to be an East Coast collection center and to provide a sea container for shipping goods.

If you would like to contribute to the International Fire Relief Mission, monetary donations can be sent to:

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If you would like more information regarding the "International Fire Relief Mission" please contact either one of us:

**Ron Gruening**  
Tel: 612-669-8500  
Email: [rgruening@gmail.com](mailto:rgruening@gmail.com)

**Mark Allen**  
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# The Nuts and Bolts of Quality Training

Nuts and Bolts – the common hinge to many mechanical and not-so-mechanical apparatuses. Training instructors – the common hinge to hazardous material/emergency responders and other occupational adult learners. Put the two together and you have the Nuts and Bolts of Quality Training.

**By Mitch C.  
Baclawski**

Fire Science Academy,  
University of Nevada,  
Reno

There are many quality works on using adult learning methodologies to teach hazardous materials workers and emergency responders. Many of these works have excellent, although extensive descriptions. In this article I would like to provide a short and easily usable version that can be assessed and applied to various training programs – the nuts and bolts of quality training.

By emphasizing the principles of adult education, trainers should be able to integrate new training technologies and techniques into their programs, improve annual refresher training, and increase the effectiveness of their courses.

Applying the principles described here to the development and delivery of training programs should ensure the programs are excellent and provide the best possible basis for working in hazardous environments in a safe and healthful manner.

## Program Characteristics

The best training programs include the following characteristics: Accuracy; Credibility; Comprehensiveness; Clarity; and Practicality. An emotional link to the students should be made and they should also perceive the subject matter as rational.

**Accuracy** can be ensured by requiring that the training materials are prepared and reviewed by qualified individuals, updated on a periodic basis, and applied by qualified and experienced individuals employing appropriate training techniques and methods.

Employing educational methods appropriate to adult learners is particularly important for the high-hazard work environment. **Credibility** is enhanced when instructional staff is experienced in applying the knowledge and skills that they are teaching, and establishing a "peer" relationship with the trainee. In other words, the instructors must have walked a mile in the students' shoes.

Excellent programs often include "reality check" learning activities that give trainees the continuing opportunity to measure the relevance of the training against their own personal experiences. In my opinion, realistic hands-on practical exercises provide the best "reality check."

Training programs must be **comprehensive** and cover everything required for someone to work safely in the industry; a requirement that is particularly critical for working with hazardous materials. Incomplete information or failing to make sure that the trainee has mastered the minimum necessary knowledge and skills can be dangerous to all. Any training under the HAZMAT standard should aim to be comprehensive rather than simply meeting the minimum number of training hours specified in the standard.

Training programs must not only be accurate, believable, and comprehensive, they must also be **clear**. If the material is understandable only by someone with a Ph.D., then the program will be less than successful. Training materials should be written in the language of everyday speech for the target audience. Further, training material should accommodate a range of different literacy levels and learning styles as discussed in the *Principles of Adult Learning* section below.

By presenting information, ideas, and skills that students see as directly useful they will find the training programs to be **practical**. This practicality can be enhanced by involving, when possible, the audience or other peers in the development of the program.

Adult learners will be more engaged and better

able to use the training if it makes sense to them. Make the training **rational** by doing your homework when developing the program. When possible, involve the students in finding out the effect this training may have on their work. How does this training add to or subtract from their work? What are the advantages or detractors of this training? During the training, acknowledge those who assisted in the development. Ask the students often if what is being presented is making sense.

Recognize that students have various expectations about the training and plan to satisfy this need. This will create an **emotional** link with the student. Exactly what this need is will be different from student to student. For some students it may be as easy as offering light refreshments in the classroom, others, the certificate of completion, and for others, it may be the internal or external recognition of completing the next level of training. It is also appropriate to highlight the importance of the training through your marketing efforts. Positive promotion of the training should communicate the training is going to give the student something they do not already have. This can be in the form of flyers, posters, email announcements, newsletters, Web pages or banners. To reinforce the power of emotional appeal, try this the next time you see a TV commercial: take a popular commercial, apply some critical observation skill, and then ask yourself, "Are they selling the product?" or "How much better will I be if I have or use this product?" Use emotional appeal in marketing the training to the students and others, in and out of the classroom.

As trainers we are all probably familiar with the notion of *you remember 10% of what you read and 90% of what you do*. Although there is controversy about the validity of these numbers, they do remind us that the best training programs have a **physical** element. People learn best by doing, especially when learning in the environment the student will actually work in. In the case of HAZMAT training, responders expected to perform at night, with limited tools, in environments requiring Level A protection should train in this same type of environment. They should also train within the administrative environment in which they are expected to perform. The students should experience the same level of management support and importance in the workplace that they are taught during the training.

### **Principles of Adult Learning**

Adult education is empowering because of the experience adults gain in educational programs. The vast majority of HAZMAT students are adults who already possess the knowledge, skills, and abilities to work in their current occupations such as firefighters, police, emergency medical responders, petrochemical process operators, and transportation workers. The objective of HAZMAT training is to provide the additional knowledge, skills, and abilities to permit these workers to safely perform their trade in high-hazard environments. Achieving this requires instructional materials, techniques, staff, and appropriate training environments fit to the target audience and based on proven principles of adult education. The following are the basic principles of adult education that can be applied to HAZMAT and related training programs:

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- Adults learn best by doing. Knowledge alone is insufficient in the HAZMAT environment. Workers must also be competent and proficient in the unique skills that are required in such work. Realistic hands-on training exercises and skill checks are essential.
- Adult learners respond better when they have the opportunity to learn from their peers. At the Fire Science Academy we recognize the critical importance of peer instructors. In general, the instructors who are experienced responders are received much more favorably than those with only academic credentials.
- Adults learn from a variety of learning activities. Employ role playing, case studies, audio-visual presentations, group discussions, lecture discussions, after action reports, drills and exercises, Web site access, and computer simulations as delivery methods. In addition, do not forget to give adequate breaks; most adults are not used to sitting all day. Breaks help to keep the delivery fresh and also provide peer to peer learning opportunities.
- The learning environment must encourage active participation. Encourage participation and interaction by arranging chairs, tables, screens, whiteboards, and other learning stations in the classroom. Make the arrangement easily changeable to allow different kinds of interaction and avoid distractions. Make the physical environment (e.g. temperature, lighting, ventilation) of the classroom comfortable to allow learning.
- Adult learners need direct experience to apply new skills. This principle is the foundation of the need for the realistic hands-on component of skills training – the physical training. Scores on a knowledge test are not a satisfactory indication that new skills can be effectively and safely applied in the work environment. Opportunities must be provided for skills to be evaluated and found sufficient to safely apply the knowledge.
- New skills should be based upon current skills. The new skills required by a firefighter, plant worker, or driver to safely perform their work during a HAZMAT incident or hazardous waste cleanup operation must be suited to the individual's current occupational skills. For example, drivers should already be qualified to operate their equipment before they receive training to operate the equipment under the unique circumstances of the hazardous waste cleanup site.
- Adult learners need frequent non-judgmental feedback. Adult learners need to know how they are doing in a manner that is not judgmental and preferably from their peers. Training must respect students existing knowledge, skills, experiences, and circumstances. Opportunities must be provided for constructive feedback to each student in the training course.
- Small group activities are important to adult learners. This approach provides an opportunity for individual learners to share and discuss what they have learned with their peer students. As adult learners benefit from the experiences of other participants. A terrific example of this happening informally is seen during breaks at the Fire Science Academy. See if you observe this in your organization.
- Adult learning must be reinforced. The knowl-

edge and skills learned for work in the HAZMAT environment must be retained to be of value to the student and their organization. This is the primary purpose of refresher training, which must include critical skills aspects. Site-specific training and periodic drills also serve as reinforcement mechanisms as newly learned knowledge and skills are applied in an actual or simulated work environment.

- Learning methods must consider the learner's technological fluency. Not all adult learners are comfortable or fluent with technology-enhanced training tools, such as computer-based or Web-based methods. The students' comfort level and fluency with technology must be considered during curriculum design and before choosing technology-enhanced instructional methods.

### Training Plans

Now that we understand the characteristics of good training programs, and how adults learn, the next step is to apply this knowledge in the development of the training plan. This subject could encompass an entire article in itself, but here are a few considerations to get you started.

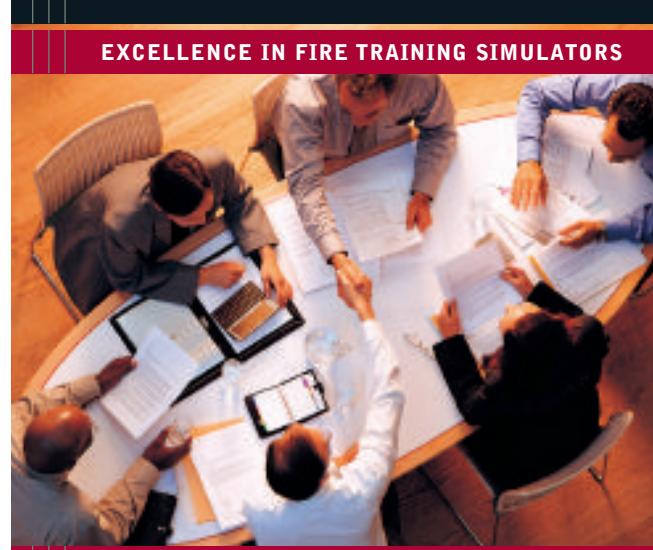
According to the Info Please dictionary (See <http://www.infoplease.com>) the definition of the word "plan" is:

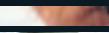
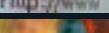
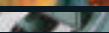
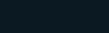
*Pronunciation:* (plan)

*n.*

**1** a scheme or method of acting, doing, proceeding, making, etc., developed in advance: *battle plans*.

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**2** a design or scheme of arrangement: *an elaborate plan for seating guests.*

**3** a specific project or definite purpose: *plans for the future.*

—v.t.

**1** to arrange a method or scheme beforehand for (any work, enterprise, or proceeding): *to plan a new recreation center*

**2** to make plans for: *to plan one's vacation.*

**3** to draw or make a diagram or layout of, as a building.

Note within the definition there is no mention of not being able to *change* your plan. Training should be dynamic, recognizing that information and techniques change. Thus the training plan is just a map to lead you towards your training goals. Of course, this begs the obvious questions – What is the goal of your training program? What should the students know and be able to do at the end of the program? We refer to this as the “Terminal Objectives.” In the case of hazardous materials training, the goal(s) may be to be compliant with applicable legislation and company policy.

Once the overall view is established it is time to break it down into tangible steps or “Enabling Objectives.” These are the steps taken along the way to reach the program’s desired results. These objectives define what knowledge and skills are required to successfully complete the program.

How do you make sure the students can reach the program goals? By incorporating the characteristics of successful programs and applying the principles of adult learning into a lesson plan. Lesson plans guide the delivery of the classes. They

make sure what needs to be done is done. It would be unfortunate to reach the end of the allotted time for the program without accomplishing the terminal objectives, and, in our example, students would not be in compliance with legislative and company standards.

Now that our class has completed their lessons, the question becomes, how do we know the students gained the knowledge and skills they need, and how did we as trainers accomplished our goals? Administering written and practical tests to students provides them, the instructors, and the program developers with a tool to measure their success. The accuracy of this measurement can be increased by using pre-tests to establish the base line.

The plan is not complete unless it contains an evaluation loop, a method to assess the compliance with the plan and its overall success. This evaluation should be done by the program developer and include feedback from the students and instructors. When possible it is wonderful to have input from other responders, the student’s team, and management or other supervising authorities. The evaluation should assess if the characteristic and principles used to develop and deliver the class were appropriate. Comparisons should be made and focus on what degree did the program accomplish the objectives, what went well, what did not go well, was the class instructed as designed, what changes should be considered, and how can this program be improved. While evaluation is critical in the process, it deserves mention that a well thought out process for making program changes should be used.

## Summary

As you can see there are many nuts and bolts to putting together a winning program. If you incorporate these ideas into your programs, you will increase their effectiveness while saving valuable time and money over the long run.

## Key points from this article for you to employ:

Excellent programs are accurate, comprehensive, clear, practical, rational, and emotional.

Adults learn:

- by doing; realistic hands-on exercises are essential
- from a variety of learning activities
- best from their peers
- in small groups

Training Plans should:

- be dynamic, changing as required
- identify terminal and enabling objectives
- include written evaluation techniques
- employ sound evaluation and monitoring loops

## Sources

National Technical Workshop sponsored by the National Institute of Environmental Health Sciences, Worker Education and Training Program\*, March 30-April 1, 2005

\*Much of this material was adapted from Nina Wallerstein and Harriet Rubenstein, **Teaching About Job Hazards** (American Public Health Association, 1\_3)

*People Remember 10%, 20% . . . Oh Really?, Dr. Will Thalheimer* [http://www.willatworklearning.com/2006/05/people\\_remember.html](http://www.willatworklearning.com/2006/05/people_remember.html)

Professional Safety, Jan. 2008, *The Rational, Emotional and Physical approach to Training Michael*, S. Melnik p.49

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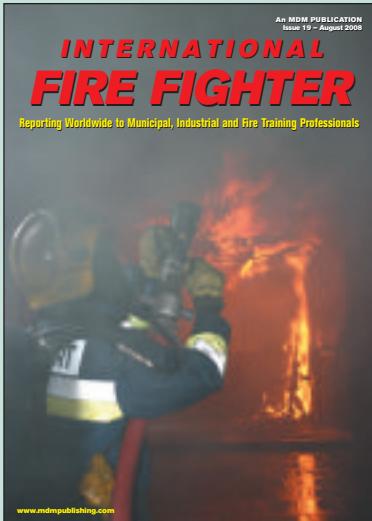


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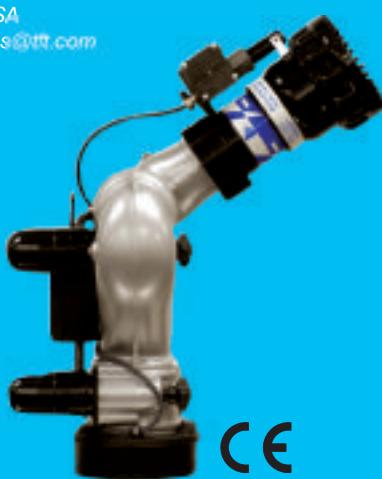


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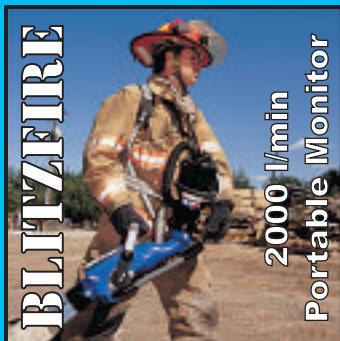
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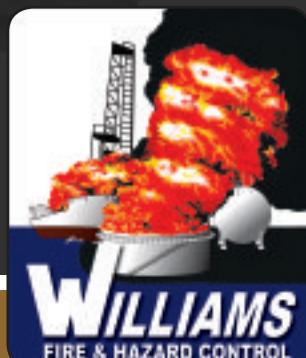
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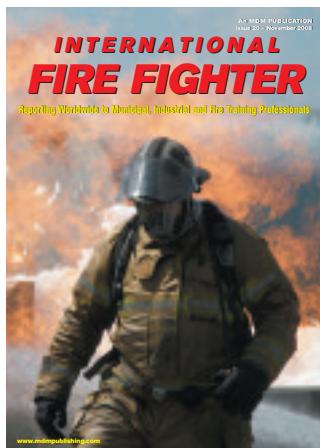
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## November 2008 Issue 20



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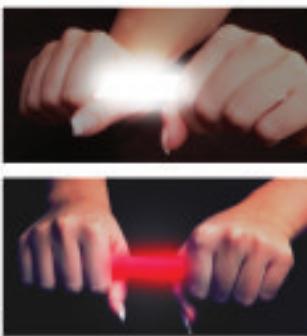


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**w w w . s p e e d i n g s l t d . c o . u k**

# Miller by Sperian covers all fall protection angles

The Work at Height Regulations 2005 are the most stringent legislation of their type in Europe. However despite this, last year in the construction industry alone 10 employees were killed, 13 self-employed killed and 3,409 seriously injured after falling from height. To help reduce these figures, MILLER BY SPERIAN, the flagship brand of the Sperian Protection group, has invested in a large scale prevention policy aimed at both users and employers and can now provide a complete fall protection solution from products through to training and equipment inspection.

In line with this policy, Miller by Sperian continues to develop innovative and bespoke products as demonstrated by new Söll Vi-Go system, which recently won a BSIF award for innovation. The cable-based vertical arrest safety system was developed specifically to meet the needs of a number of Sperian's European clients and was built on Miller by Sperian's successful rail-based technology, Söll Glide-Loc, which renders vertical arrests of up to 200m safe. The Söll Vi-Go system adopts the energy absorber of its fellow rail-based product, which is integrated into the fall arrester rather than the cable's fixed supports. The absorber is quick to react in the event of a fall. It considerably reduces erratic body movements as well as the force exerted on the user without excessively wearing the cable to which it is attached. In the event of a fall, and in accordance with standard EN 353-1, the impact force exerted on the user must be limited to 6 KN. The Vi-Go bracket keeps the impact force levels far below this value.



As well as its innovative products Miller by Sperian now offers tailor-made safety at height training courses taught by experienced instructors. For flexibility, these training courses can be taken at one of the many Miller by Sperian

centres, which are growing in number year on year worldwide, and also within user companies themselves so that the hazards posed by the environment and the protective solutions used can be assessed in-situ.

In addition to its product and training offerings, Miller by Sperian has launched an automatic inspection date reminder system through its dedicated fall protection internet site: [www.ritaserv.com](http://www.ritaserv.com). After registering their company and equipment details on the site, users receive an



automatic reminder about the equipment's final annual inspection date. The equipment can then be taken to a dedicated Miller Service Point (MSP) for inspection, enabling employers to ensure they meet their legal obligations.

For further product information please visit [www.fall-protection.com](http://www.fall-protection.com). A technical brochure is available on request.

For more details about Miller by Sperian's training and inspection services, visit [www.ritaserv.com](http://www.ritaserv.com)

## Mayday Hansa Board Rescue System – for fast and safe surface rescue

**The rescue board**, a further development of a windsurfing board, is protected by patents all over the world and developed with environmentally safe materials. Mayday Hansa Board has been developed by the company Mayday Scandinavian International AB in cooperation with Swedish professional life rescuers at the Fire and Rescue Services, the Life saving Society and the insurance company Trygg-Hansa.

It has been in use for the last about 15 years by the Swedish and the Nordic countries Norway and Finland Rescue Department. The Mayday-Hansa-Board is sold all over the world, including Scandinavia, Europe, the US and Canada and Asia. There are several applications for the board it can even be used with helicopters and a compliment to boats.

In Sweden the Mayday-Hansa-Board is included in the official training programme for professional rescuers on the life rescue school and almost every fire department is equipped with a Mayday-Hansa-Board for rescue operations in all types of water, icy or open, river and streams, mud and floods. The first rescue vehicle out to a surface accident always bears a Mayday-Hansa-Board.

In an interview with Fire Captain, also team leader and professional diver, Alf Alexandersson, from Kungsholmens Fire Department in Stockholm, Sweden, he states the following comments about the Mayday-Hansa-Board Rescue System:

To know that you are coming back to own safety is a condition for being able to perform a professional rescue operation. Fire captain Alf Alexandersson means that behind all the equipment is a human being. For going out to rescue a person in distress, is the key word safety, therefore it is very important with the right and effective equipment, and a lot of training for being well prepared when an accident occurs.

**For more information please contact:**  
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Alf also mentions a particular case when they saw the importance with effective equipment:

It was an ice accident, a man had broken through the ice, about 100 m from shore. A surface rescuer wearing only a dry suit tried to reach out to the distressed person. He only managed to get out 25m before he broke through the ice.

After 2-3 minutes the rescue personnel arrived with the Mayday-Hansa-Board, and with unloading his own bodyweight on the board the rescuer could easily run with the board on the ice out to the victim without breaking through the ice. Within a few minutes the distressed man was safely on shore again.

It was such an obvious difference having the right equipment. The Mayday-Hansa-Board and a dry suit was a condition/determined in this operation for a fast and safe rescue operation with a happy outcome.

Quote: "With the Mayday-Hansa-Board as a life insurance, I can focus on the rescue operation without anxiety for my own security, which is a condition for both be willing to go out in an dangerous situation and being able to perform a good and professional rescue operation"

*Rescue Captain Alf Alexandersson*



# New SKUM™ Foam Trailer Monitor Unveiled

Tyco Fire Suppression & Building Products has unveiled a new SKUM™ brand fire fighting foam trailer with a range of tank capacities up to 2,200-litre (485-gallons). The trailers have optional capabilities including the latest generation of manually-operated SKUM FJM Fog Jet Monitors in capacities to suit site conditions.

The heavy-duty monitors are constructed with built-in foam concentrate inductors, eliminating the need for a separate proportioning system. The new unit is designed for fast response and reliable deployment and to provide years of low maintenance, trouble-free service in a host of challenging hydrocarbon processing, petrochemical, heavy industrial, military and aviation environments.

The compact, balanced design SKUM monitor has a maximum working pressure of 12bar and produces exceptional flow performance characteristics that ensure fast fire knock-down. Its wide and adjustable flow range and long throw length combined with the monitor's low weight and low friction bearings, means that it can be brought into action quickly, accurately and safely.

The monitor has a water capacity of up to 10,000 lpm (litres per minute) at 10bar and a constant flow nozzle, so the nozzle capacity is unchanged whether it is used to deliver a fog or jet of foam or water. It can be rotated through a full 360 degrees; its vertical elevation is between minus 60 degrees and plus 90 degrees, and it can be locked in any desired operating position.

Even in the most extreme environments, the new SKUM unit has impressive durability characteristics. The monitor has a stainless steel body and a bronze nozzle and bearings, and is mounted onto the unit's fully-welded tank that is fabricated from 2.5mm thick stainless steel and incorporates a 250mm diameter auto-venting, quick-release fill lid, and internal baffle plates to minimise any surge.

The trailers can be 2 wheel or 4 wheel to suit the tank capacity and is mounted on an 'A' frame steel channel chassis that is fully galvanised, and its standing area/deck plate is aluminium. It incorporates a beam axle system to increase stability and reliability, and ensure its suitability for



harsh industrial locations. The stability of the new SKUM trailer is further boosted by the incorporation of industrial heavy-duty, fully retractable prop stands with jacking pads on each corner, and the new SKUM trailer's suspension is far more reliable over rough terrain than any other suspension system.

The unit's four-way inlet manifold with one-way check valves ensures that there is no loss of water if any individual hose is punctured. This manifold is connected to the monitor via a 100mm waterway that is integrally welded inside the tank and terminates at the monitor. All of the pipe work in the tank is stainless steel to safeguard against the possibility of corrosion caused by the foam concentrate.

The trailer is fitted with a 50mm ball-hitch coupling although other international standard towing eye connections can be supplied, the lighting and breaking system fully conforms to International standards' laid down for towing trailers on public highways. The two pack epoxy paint finish gives a very durable finish to ensure long corrosion free life in the most arduous of conditions. The Skum range of FJM monitors are FM (Factory Mutual) approved and certified by DNV (Det Norske Veritas), Rina (Registro Italiano Navale), and BV (Bureau Veritas).

Further information on the new SKUM foam trailer monitor is available from Tyco Fire Suppression & Building Products by telephone on +44 (0) 161 875 0400, by fax on +44 (0) 161 875 0490, or via email at [marketing@tyco-bspd.com](mailto:marketing@tyco-bspd.com). The new SKUM website is at [www.skum.com](http://www.skum.com)



## Rapid Response Mobile Foam Trailers

# Foam fire fighting trailers - customised to suit your site requirements.



- Shown with SKUM manual monitor & 4 inlet manifold
- Durable high quality chassis construction
- Option tank sizes up to 2,200 litres
- Fully customisable specification





**By Jan Knappert  
and Heinrich David**

# Alcohol Resistant F In Extremely Low T

Recent oil and gas discoveries have been found in the most inhospitable climates, where extremes of temperature are common, notably the Middle East where blackbody temperature can achieve +90°C and within the artic circles of -40°C and lower.

**T**hese extremely low temperatures have given fire fighters severe difficulties in Fire Fighting Foam Concentrate selection when dealing with fuels containing alcohols and polar solvents.

Originally Alcohol Resistant Foams were developed using Polysaccharide Polymer Additive to form a stable blanket between the fuel and foam blanket, this minimises vapourisation of the fuel and minimises the alcohol absorbing the water in the foam bubble wall and causing it to break down and become ineffective.

In low temperature environments these Polysaccharide containing foams become extremely viscous because of their chemical composition (they are also known as Thixotropic or Non-Newtonian Liquids) and are then difficult to pump, at temperatures below -15°C, they will start to solidify and will be rendered unusable.

Ongoing product development between MSR Dosiertechnik GmbH and Dr Sthamer – Hamburg,

have developed not only a revolutionary low temperature foam for use at extremely low temperatures down to -25°C but also the means to proportion accurately at these extremely low temperatures.

**FireDos** is water driven foam proportioner, which does not require any external energy. Changing flow-rates, working pressures and viscosities of the dosing material have no influence of the admixing-rate.

The system consists mainly of a water motor and a piston pump. The foam concentrate is stocked in an atmospheric tank. The shaft of the water motor and the shaft of the piston pump are connected over a clutch. The whole water volume to the foam generators is passing the water motor. The number of rotations of the water motor are flow-proportional. The water motor is actuating a piston pump. The discharge volume of the piston pump is proportional to the number of rotation.

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[www.firedos.de](http://www.firedos.de)

# oam Proportioning temperatures



Any change of water flow changes without any delay the discharge volume of the piston pump, therefore the concentration remain constant.

The combination between water motor (positive displacement system) and piston pump (positive displacement system) create a accurate admixing rate, also in case of admixing rates of 1% or lower.

**FireDos** creates a pressure loss in the water system. The pressure loss is depending of the flow-rate, the working pressure and the admixing-rate. In case of a maximum flow-rate, a water pressure from around 10 bar and an admixing rate of 1% the pressure loss will be approx. 1 bar.

The system is able to admix all types of common fire fighting foam concentrates, also alcohol resistant foam concentrates and protein foams.

In combination with the right foam concentrate and foam generators low expansion, medium expansion and high expansion foams can be produced.

An excellent combination is **FireDos** and **Dr Sthamer - Hamburg Moussol APS LV 1x1** Alcohol resistant low viscosity foam concentrate with an admixing rate of 1%. Foam temperatures from minus 27°C and plus 25°C had no influences of the admixing rate. An ad-mixing rate 1.08% was achieved across the whole temperature range with different water flows and water pressures. Many installations have now been made with this combination of ad-mixer and foam concentrate.

**FireDos** is a compact admixing system and can be used for any fire fighting application, like fixed installations, in fire trucks, on ships, off shore in mobile applications. The water can be fresh water, brackish water or sea water. The systems are in flow-rates from 10 l/min and 20,000 l/min, with fixed, in steps changing or simultaneously changing admixing-rates from 0.1% up to 10%, working pressures from 16 bar, 25 bar and 40 bar and working temperatures up to 50°C and 80°C available.

The biggest advantage of **FireDos** is, that the system can be tested under real conditions foam to water without producing any premix solution.

An other possibility is the remote injection of the

foam concentrate. Between the system with foam tank and the injection point can be a distance up to 1,000 metres away.

With features like reducing of the minimum flow can the flow-range expanded up to 1:100.

**FireDos** has the VdS approval, the KFI (Korean Fire Institute), GL (Germanischer Lloyd, Marine approval), GOST-R approval (Russian Federation), approval from the Czech and Slovakian Republic. Applied for FM approval. The first batch of these units are in the FM laboratories for testing procedures.

IFF

## PRODUCT NEWS

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# MFC Survival launch a new motorised sled

MFC SURVIVAL's RS15T Motorised Rescue sled is ideally suited for use on inland waterways and as a means of transportation for people and equipment in flooded urban areas.

Following the success of the range of MFC Rescue Sleds, MFC Survival has added a new product to compliment the MFC Survival water rescue solution which includes walkways, API stretchers, hose inflation kits, drysuits, level 1 water rescue kits, lifejackets and sleds.

After much discussion with many of our customers MFC Survival decided to redesign and power their best selling water rescue sled. This resulted in the RS15T. It is fitted with an integral transom with a non return drain port and towing 'u' bolts. Fully inflatable within minutes, the RS15T provides a completely stable and manoeuvrable safe working platform. Easily stowed, the 5m x 2.14m sled packs into a valise which measures just 1.65m x 0.55m x 0.35m.

Lightweight, the RS15T weighs just



56kg making it easily transportable. The sled is ideally suited for use on inland waterways and as a means of transportation for up to 15 people in flooded urban areas, especially where

mass evacuation is needed. It can also be used to tow. The shallow draught enables use in shallow waters of approximately 40cm depth and the large bearing surface makes the sled ideal for ice and mud rescues. With integral stern boarding steps the sled is easily boarded.

Fully laden and to full capacity (15 people or 1200kg) in trials the sled still powers along at 11 knots with a 15HP, 2 stroke engine and at 23 knots with 2 people.



## NEW: MSA Modular SCBA System for Fire Service

(For every fire service the optimal breathing apparatus model)

MSA announces a new SCBA system specifically created for the versatile demands within emergency service applications. In order to fulfil the requirements and budgets for diverse tasks the MSA SCBA system can be completely customised. Users compare and choose from a selection of backplates, harnesses, pneumatic systems, rapid cylinder exchange couplings and monitoring electronic components. MSA, in addition, provides 'presets' for those users who don't want to configure their own SCBA system. Overall, MSA gathered input and conducted interviews from hundreds of active firefighters, representing a strong "voice of the customer" influence into the MSA design.

Established in 1984 in Abu Dhabi, **MSA Middle East** is the regional office for MSA in the Middle East. Our local presence has enabled MSA to be close to its customers and in many cases custom products & safety solutions were tailor made to fulfill the ever demanding needs of exploration rigs in the Arabian Gulf as well as civil defense fire

units in UAE, Saudi Arabia & Iraq.

MSA is a global leader in the development, manufacture and supply of sophisticated safety products that protect people's health and safety. The company's comprehensive line of products is being used by workers around the world in the fire service, homeland security, construction and other industries, as well as the military since 1914. Principal products include self-contained breathing apparatus, gas masks, gas detection instruments, head protection, respirators, ballistic body armor and thermal imaging cameras.

**Additional information is available on the company's website at [www.msamiddleeast.com](http://www.msamiddleeast.com)**



The RS15T has many features such as stowage pockets, control line patches, internal and external lifelines fitted as standard and many more can be fitted to suit customer requirements.

MFC Survival's research and development team has again proven that listening and responding to customer requirements and ideas provides a platform for continuous, new and existing product development to benefit all.

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## New Sperian protection gloves offer enhanced protection

SPERIAN PROTECTION has launched two innovative new products that combine enhanced protection and maximum freedom of movement: Perfect Poly Aqua and Polytril Air Comfort gloves.

Sperian is well-known in the hand protection equipment market and is constantly developing new materials to design protective gloves that perform better and are adapted to the varying risks encountered in the workplace.

Polyurethane (PU) gloves are recognised for their ability to resist abrasion and tears, as well as their comfort (flexibility and breathability). However, the method used for their manufacture involves the use of a toxic solvent, DMF (DIMETHYLFORMAMIDE) to dilute the polyurethane.

Perfect Poly® Aqua gloves, knit polyamide/spandex with a water-based (thus solvent-free) PU coating on the palm and fingertips eliminating toxic dangers, reducing the risk of allergies and minimising their environmental impact.



What's more, this glove offers extraordinary comfort. Indeed, thanks to the water-based solution, the PU does not penetrate the glove (unlike standard polyurethane gloves) so there is no contact between the hand and the coating. The addition of lycra in the material makes it close-fitting to the hand.

New fibre technology has increased the absorption properties of the polyamide,

reducing the feeling of perspiration. The volume of water soaked up by the ultra-absorbent knitted material in the Perfect Poly Aqua gloves is 76% greater than that absorbed by standard polyamide gloves. This glove also garners better marks than its cotton counterparts. Thus, Perfect Poly Aqua offers workers long-lasting comfort and a perfect fit.

Sold in lots of 10 pairs packaged in a polyethylene pouch that is 100% photodegradable in three years, Perfect Poly Aqua gloves help to protect the environment.

Admired for their natural feel and high breathability, leather handling gloves are sometimes considered uncomfortable. Thanks to the glove's polyamide/cotton/lycra woven material, Polytril Air Comfort offers a high level of comfort and grip.

Its foam nitrile coating on the palm and the fingertips ensures excellent abrasion resistance and good impermeability to oils. Foam nitrile contains air bubbles which help to limit perspiration without affecting the user's sense of touch.

For more information on Sperian visit: [www.sperianprotection.co.uk](http://www.sperianprotection.co.uk)

## Dr Sthamer – Hamburg launches new environmentally friendly Alcohol Resistant Fluorine Free foam

DR STHAMER – Hamburg, has launched at the Fire Service College, Morten in Marsh, their latest development, Moussol FF 3/6.

A revolutionary new Fluorine Free alcohol resistant fire fighting foam, the foam has been specifically designed to answer the calls for an environmentally friendly foam which does not contain Fluoro-Surfactants.

The foam can be used at 3% induction rates for Hydrocarbons and 6% for Polar Solvents, it has been certified to EN1568 parts 1, 3 and Part 4 with a rating of 1A/1B.

It can be used with all types of foam making equipment, Monitors, Branchpipes, over the top pourers, etc.

Moussol FF 3/6 can be used with fresh, salt, brackish and recycled process water.

This latest addition to the Dr Sthamer-Hamburg arsenal underlines the company's commitment to remaining at the forefront of Fire Fighting Foam development.

For more information please contact Jan Knappert – International Sales Director, tel: +44 (0)7795 101770, [jknappert@sthamer.com](mailto:jknappert@sthamer.com) and at [www.sthamer.com](http://www.sthamer.com)



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e2v the manufacturer of Argus cameras has a long history of supplying revolutionary solutions to the world's firefighting markets. Starting with the Pevicon™ based Argus, e2v has since launched the Argus2 and 3 to an ever more educated customer base.

For more information about Argus cameras please visit our website at [www.argusdirect.com](http://www.argusdirect.com) or contact your closest Argus sales office:

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**T**echnology has come a long way since the first vacuum tube based devices. Picture quality has improved beyond recognition, reliability has increased five-fold and the cost of ownership has vastly reduced. Additionally, thermal imaging cameras are offered with stronger warranties – Argus4 cameras are offered with an extended two-year warranty for peace of mind.

The Argus4 HR320 is latest fire camera to join the Argus range. With its 320 x 240 high-resolution detector, and high definition LCD screen, it provides by far the best image quality of any hand held thermal imaging camera on the market today.

Argus cameras utilise a Microbolometer sensor, matched with electronics designed and manufactured by e2v, ensuring that quality and durability are built in. Argus cameras are designed to the highest specifications to instil confidence in emergency services personnel that they are using the best thermal technology available to them.

The Argus4 HR320 infrared remote control and PC software allow end users to configure the camera to their specific needs. Once a fire fighter's settings have been chosen, simple button operation allows the user to switch the camera on and off, take pictures, and activate the x4 digital zoom facility.

The camera is extremely light, weighing less than 3lbs (1.3kg). It comes packed with the most advanced features available on the market today, these include:

**Enhanced Dynamic Scene Colourisation (EDSC):** This feature provides the user with an opportunity to colourise the thermal image. With the Argus4 HR320 the dynamic scene colourisation has been enhanced to give the user greater information.

**argus<sup>4</sup>**



**Direct Temperature Measurement (DTM):** This feature displays the temperature of objects within a defined area of the thermal scene.

**SceneSave™ Digital Image Capture:** The Argus4 HR320 can capture and store up to 100 images. These can then be viewed or deleted using the remote control supplied. Using the software provided the captured images can be downloaded to a suitable laptop/PC and then exported in various formats.

**Tri-Mode Sensitivity:** The Argus4 HR320 now has an expanded third level of sensitivity for very high scene temperatures, enabling clear imagery at all temperatures. This expanded temperature range means that temperatures in excess of 1000 degrees celcius can be identified.

**Customisable Start-up Screen:** A feature of the camera that allows brigade logos or station names to be added to the start-up screen. This can be beneficial for asset tracking and/or personalisation of the camera.

**Ambient Temperature Measurement:** A sensor fitted to the front of the camera measures the ambient temperature of the local environment, which is then displayed on the viewing screen.

e2v thermal imaging cameras were the very first to be supplied to the world's fire fighters back in the 1980s. Argus thermal imaging cameras as they are now known, have come a long way since then, with e2v continuing to provide the most advanced TIC's to fire and rescue personnel working to save lives and property.

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# Sperian protection expands its Bac'Run safety footwear range

The Bac'Run® range of safety footwear from SPERIAN PROTECTION is expanding with the introduction of 11 new models. Combining modern design with improved performance in terms of lightness, safety and comfort, the new Bac'Run Free shoes will further reinforce the leadership and success of this collection of safety footwear that has been widely adopted across Europe.

The new products in the Bac'Run Free collection build on the elements that have secured the success of the Bac'Run range: the dual density polyurethane (PU 2D) outsole with excellent grip and shock absorption and the Spacium™ non-metallic toe cap that resists to 200 joules, insulates against heat and cold.

In addition, Bac'Run Free safety shoes offer 100% non-metallic protection: they feature the Flexium™ anti-perforation mid-sole made from high-tenacity textile fibers to provide greater flexibility and suppleness for users as they move.

In addition, thanks to a new polyurethane formula and a new injection process, it has been possible to reduce the weight of the outsole and shoe by more than 20% therefore preventing user fatigue brought about by frequent movement and prolonged standing. Moreover, the slip resistance properties of the Bac'Run



Free outsole are compliant with the requirements of the new standard EN ISO 20345: 2007 SRC.

The Bac'Run Free collection does not stop at merely offering the best in protective materials. The footwear research and development teams at Sperian Protection have given special attention to the design of the shoes and the selection of leathers and linings.

The characteristics of the leathers (water-repellent or suede) were studied according to the specific requirements of each of the different European markets so as to best meet user needs. The inner linings are made from Poromax® and are in fennel green or bright orange to bring a touch of modern design to the shoes. With quick dry technology they guarantee better foot hygiene for the user as well as an extended life cycle.

For more information on Sperian visit:  
[www.sperianprotection.co.uk](http://www.sperianprotection.co.uk)

## FLAME-SIM™ Accredited for Class by Florida Bureau of Fire Standards and Training

The Florida Bureau of Fire Standards and Training has granted accreditation to FLAME-SIM™ for use in a class titled, "Fire Officer Virtual Experience Skills Training (VEST)". The class is being offered at the Florida State Fire College, the first fire training academy to offer course work utilizing the revolutionary training software. Kerry J Ganofsky, CEO and Founder of FLAME-SIM stated "we are extremely excited about this acceptance and to have FLAME-SIM used in an academic setting, especially with such a renowned school as Florida State Fire College".

VEST is a twenty-four hour class given over three days to teach strategies and tactics to company officers and chiefs. Goals of the program include:

- Improving the tracking and coordination skills of the on-scene Fire Officer.
- Limiting Micromanagement in real-time events.
- Interfacing with FO from multiple agencies, spreading the pros and cons of varying SOG.

Chris Dyer, the instructor developing the course with Florida State Fire College explained, "We are excited to offer the new V.E.S.T. course into the college's January 2009 curriculum".

For more information on the Florida State Fire College, visit their website at [www.floridafireprograms.com](http://www.floridafireprograms.com). Or for more information about Flame-Sim, contact Doug Seebach on +1 877 FLAME01



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# In the struggle between Man and Nature, Man best plan to be prepared

**ISO/FDIS 20712**

## Paradise lost

The sun beats down on you as you lay on your sun lounger in some foreign paradise. Children play on the shoreline whilst their parents chat casually with other holiday makers on the loungers next to them. You can't understand what they're saying, the beach is filled with families from across the globe all intent on relaxing and enjoying their hard earned holiday, but that's just fine for you as not understanding them makes the chatter all the easier to ignore.

**By Michael Brand**

You're insignificant and unimportant, perhaps one of thousands almost on this coastline. It's just as you'd wanted when you booked the get away at the travel agent, they'd highly recommended it for peace and quiet. The waves gently wash up the sandy shore and you drift lazily and slowly off to sleep...

You rouse slightly, a child shouts something from the beach so loud that you've been woken. Their parents should teach them better, people are relaxing! The child's family close to you chatters

hurriedly. What in the blazes is all the racket about you can't help but wonder. As you bolt upright you hold your hand to your eyes, your vision takes time to settle from having been in the sun so long and as it does your breath escapes you. In the distance is a wall of pure blue, sparkling here or there in the sun, and it seems almost to be frozen in the air. The shore line has disappeared, the sand stretching now out to the base of the floating expanse of water, causing an eerie quiet. Screams from up and down the beach pierce the silence as



people begin to flee up the sand banks only to pause in bewilderment at the top unsure of where to go. You continue to look on in horror as the spectacle grows in size as it nears. You wonder how, just how, your going to survive this. You think, 'I wish I was back in the office'...

#### Nature's fury

A Tsunami. An unimaginable display of nature's power and one of the many increasing dangers in these times of global climate change.

On December 26th 2004, Boxing Day, there was an undersea earthquake at 00:58:53AM

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(UTC/GMT). Its epicentre was off the west coast of Sumatra, Indonesia, causing many devastating Tsunamis along the coastlines of many of the countries bordering the Indian Ocean. The quake was caused by subduction, two of the Earth's tectonic plates colliding and with one sliding 'under' the other. It was the second largest earthquake ever recorded on a seismograph measuring in at approximately 9.2 on the Richter scale.

The resulting death toll was in the hundreds of thousands. Waves of up to 30 metres high fell against the resorts and beaches washing away hundreds of properties and thousands of people. It is estimated that 230,000+ people died as a result of the earthquake and resultant tsunamis. The relief effort, still continuing today, is estimated to take 5–10 years to complete and likely to be the costliest in human history.<sup>1</sup>

#### **Unprepared and unrelenting**

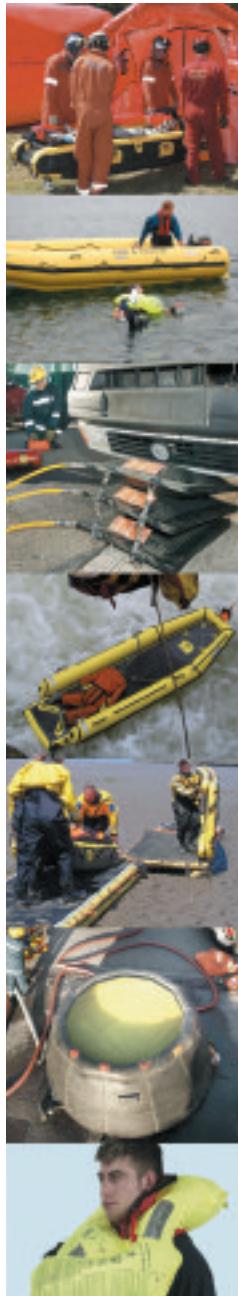
In Phuket, Thailand, There was no plan for evacuation. There was no early warning system in place nor system to alert people once the threat had been recognised. Even something as basic as a siren was found nowhere on the beaches. Upon realising their fate people rushed away from the impending danger but were unsure of where to proceed from there. Obviously uphill would be the first answer or failing that a person may have known to seek refuge in a 'substantial building' such as a Hospital (proceeding to the third level or above to ensure likely safety). However, a maze of streets and foreign language direction signs, or a wall of pathless jungle woodland if you was lucky to be on holiday in a secluded resort, presented a serious hindrance to seeking safety.<sup>2</sup>

**There was no early warning system in place nor system to alert people once the threat had been recognised. Even something as basic as a siren was found nowhere on the beaches.**

It is fair to say that had signs guiding people what to do in a tsunami emergency been in place, with routes of escape to safe buildings and land masses high above sea level maintained and correctly signed, many more people could have been saved.

This concept has not been lost on those rebuilding their lives still many years on. On Pulo Breuh, an island of the tip of Indonesia, 12,000 people, half the islands population, perished in the cataclysmic event. In the village of Ulee Paya, using a grant from the British Red Cross, the inhabitants have made good an old "off the beaten track" road. It was used by many of the villagers during the tsunami to escape the floods. It has now been prepared clearly signed in order for the villagers to have a safe evacuation method.<sup>3</sup>

This is likely to be the case across many areas devastated by the tsunami. But as in the case



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above many signs installed will be in the local language with symbols perhaps best understood by that country's local population. But what of foreign visitors? Few people learn little if any of the local language when travelling abroad. In event of an emergency will the signs now displayed be of use to all or only those privileged to be able to read the language?

#### **A World working together**

It has long been identified by the World Tourism Organisation that the use of differing flags and signs on beaches around the world presents a danger to the beachgoers international users and the use of poorly designed signs a risk to all. In light of this ongoing danger and as poignantly highlighted by the tragic events of December 2004 a comprehensive range of signs has been developed for use on beaches and other water areas as the first part of the ISO 20712 series of standards on Water Safety.

The standard comprises the following:

*Water safety signs and beach safety flags – ISO/FDIS 20712*

- Part 1: Specifications for water safety signs used in workplaces and public areas
- Part 2: Specifications for beach safety flags — Colour, shape, meaning and performance
- Part 3: Guidance for use

As a function of Part 1 a range of signs has been developed to give direction to safety in the event of a Tsunami occurring. Two themes of sign are available, evacuation to a land mass of sufficient height above sea level or evacuation to a substantial

building able to provide refuge, with variations for the different arrow direction possibilities.

The whole range has been tested using the procedures of ISO 9816-1:2007 *Graphical Symbols – Test Methods – Part 1 : Methods for testing comprehensibility*.

This means the signs have been produced to a standard internationally recognised as being easy

#### **A comprehensive range of signs has been developed for use on beaches and other water areas as the first part of the ISO 20712 series of standards on Water Safety.**

to understand and interpret, usually not requiring further text to explain the meaning allowing people of all nations to be clearly instructed in safety.<sup>4</sup>

#### **Resting on laurels**

With the relief effort having long been underway it can only be hoped that in areas where signs have already been purchased and displayed that the benefits of this new ISO are truly understood causing a re-purchase of the new ISO compliant signs by those in charge of life safety.

For those areas still re-developing, again, it has to be hoped, as with many ISO publications regardless of circumstance, that knowledge of the



standards existence has reached key buyers and purchasers. Their commitment to safety is hopefully such that they will want to purchase signs to an internationally recognised standard ensuring quality.

In the particular case of the Tsunami affected resorts and coastlines, it is important to give further consideration as to the possible risks such unique emergencies can present. With ISO standard signing in place can any more be done to secure the safety of tourists and civilians alike? A resting on laurels prior to the Tsunami meant the many locations were entirely unprepared for when an emergency situation occurred.

### Broadening the horizons

An interesting thought is what would have happened had the Tsunami occurred at night? Striking at approximately 10:AM GMT/UTC it would have been a glorious sunny morning. Have precautions been taken against such an occurrence? Newly installed signs would also need to be well lit to be of any use at night. They would require connecting to an external power source and a system of monitoring and maintenance. What then once a wave has struck? Will the power infrastructure be such that it will be unaffected by the Tsunamis furious strike? Unlikely.

Here, as previous, we have a potential disaster waiting to happen but it is unlikely anything will be done. A lack of planning and consideration with a focus only on re-action, not pro-action, being employed. The simple use of innovative technology, such as photoluminescence signage, would quickly negate many of the risks mentioned. Signs conspicuous by day or night,

self-powered and can with graphics to the new ISO standard.

By employing a pro-active mentality we can continue to truly analyse the risks involved. Lets assume it is night still with poor visibility. Our self-powered photoluminescent signs continue to illuminate the general direction for evacuation. But streets can look the same and errors in judgement can be made on which routes to take. As is becoming increasingly popular in Britain what could be utilised is a Way Guidance System. A series of floor markers and indicators giving confidence to the

**The simple use of innovative technology, such as photoluminescence signage, would quickly negate many of the risks mentioned.**

evacuee that they are quickly reaching safety and following the correct path by giving additional instruction. Edge markers can be used to highlight dangers on the route that by day may be highly visible but at night become dangerous hazards such as signposts (how ironic!). In our example, where power supply is a concern, this can all be done once again with photoluminescent material.

### Bright future?

A re-active approach to safety is the greatest threat to people's lives across the world. Implementing safety to ISO standards is commendable and demonstrates a commitment to safety but it should not be viewed as a minimum compliant level guaranteeing safety. It should be looked at as a benchmark. The many great disasters of our time have often been due to someone having implemented the minimum of safety precautions rationalising the choice as 'it will never happen to me'. Invariably disaster ensues. Lets hope that the inception of this new ISO standard gives the many responsible parties for the numerous locations across the globe where the standard is relevant a reason to consider safety further. To go beyond simply re-acting and begin pro-acting. People's lives depend.

*"No, no....we don't need anymore life boats, this here ship is Unsinkable!"*

Health & Safety manager for the Titanic.... (Maybe)<sup>5</sup>

[www.means-of-escape.com](http://www.means-of-escape.com) **IFF**

### References

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3. [www.redcross.org.uk/standard.asp?id=85098](http://www.redcross.org.uk/standard.asp?id=85098)
4. ISO Focus Sep 2007
5. Parody of following: "Your uncle here tells me you proposed 64 lifeboats and he had to pull your arm to get you down to 32. Now, I will remind you just as I reminded him these are my ships. And, according to our contract, I have final say on the design. I'll not have so many little boats, as you call them, cluttering up my decks and putting fear into my passengers." – J. Bruce Ismay, Director of the White Star Line, Operators of the Titanic

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*Aircraft Simulator with Sthamex AFFF at 3%. Picture courtesy of Mark Bathard*



# Angloco/Airwave conference and demonstration day

Date 9th October 2008

Venue, The Fire Service College,  
Moreton in Marsh

By **Mark Bathard**

I decided to accept an invite sent to me some weeks ago from the offices of Alistair Brown, associate director for Angloco to the Angloco/Airwave demonstration day. The day was to be an informal affair with some presentations made by companies who Angloco represent in the UK and Ireland. These presentations were to be followed by a static display of the company's hardware and after lunch, some live burn demonstrations. Some of the companies who Angloco represent and who were on hand to answer any questions as well as having displays on the day were, Bronto Skylift, Gunzburger Steigtechnik, Rosenbauer, Spectenhäuser and Dr Sthamer Hamburg.

After the morning meet and greet and the mandatory refreshments, we were invited into the theatre at the Fire Service College to begin

proceedings. Bill Brown, Chairman and Managing Director of Angloco Limited thanked all who were in attendance which included representation from three industrial brigades, thirty eight fire brigades and one airport. Thanks also went to five of the fire and rescue services Avon, Limerick, Staffordshire, Warwickshire and West Midlands who had loaned vehicles for the day to assist in the static displays as well as the live demonstrations.

Bill then handed proceedings to his son Alistair who introduced Angloco and gave us a bit of history about the company and its core business. Interestingly, Angloco is still a family owned business. Its inception was back in 1965 and now employs 60 staff in a plant of over 35,000 sq feet. Turnover for 2007 was just under 13 million pounds. Angloco are the leader in industrial

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*Static display area at the Fire Service College.  
Picture courtesy of Mark Bathard*

vehicles and over half of their vehicles are exported, they also have a long standing business relationship with the MOD. Training is also a very important aspect of Angloco to the point that they are heavily investing in 3D "blue light" driver training software.

Next on the Podium was Mark Pearson who was representing Airwave Solutions. Airwave co-sponsored the day with Angloco and provide the UK fire service with resilient communication systems that effectively mean that fire fighters and other emergency service responders can communicate in even the harshest of conditions and in some of the most inaccessible locations. The uniqueness of Airwave and its "Firelink" solution, is that it offers a seamless communication between the fire services and all other responders even when all other networks fail thus resulting in a safer, more efficient response. The Firelink solution should be fully operational by 2010.

We were then taken outside to a static area where various vehicles, pumps, ladders and foam equipment were placed on display. A technician from Finnish aerial appliance manufacturer, Bronto Skylift was on hand to answer questions from the visiting delegates. One of the highlights of the display (no pun intended) was the Bronto Combined



Aerial Rescue Pump (CARP) that elevated up to an astonishing twenty eight meters. A break for lunch followed and we were then back in the theatre for two more presentations.

Alistair Brown once again took the podium and introduced the latest range in pump technology from Rosenbauer. The Otter which is classed as a lightweight portable pump has an air cooled motor, low fuel consumption and insensitivity to dirt. The Otter is also available as a diesel version. Another portable pump from Rosenbauer is the new Beaver which boasts a pump output 1200l/min at 6bar and only weighs 130kg including a full 20l fuel tank. The Fox is another marvel of pump design with an output of 1600l/min at 10bar and is the lightest pump in its class with a four stroke engine. Alistair then went onto explain about Rosenbauer's CAFS systems namely Poly CAFS, Flash CAFS and Conti CAFS. Poly CAFS he explained is for the highest effectiveness in the first decisive minutes and completely independent of external drives or power of any type. Flash CAFS are a tailor made system for specific extinguishing agent rates at the highest possible output rates. Conti CAFS is a continuous foam release with different expansion rates possible at several nozzles simultaneously.

The last presentation before we were invited to go to the Fire Service College's training ground for the live burn demonstrations was chaired by Jan

Knappert who is the International Sales Director for Dr Sthamer Hamburg. Jan explained about the different foams types, and how and when best to use them. Class A foams which are used to fight three dimensional fires offer rapid flame knockdown and because of its sticky nature, coats the fuel source with a blanket of bubbles. A good scenario for Class A foams would be a tyre fire and as Jan pointed out, this would be demonstrated later on the fire ground. AFFF foams are used to fight class B hydrocarbon based liquid fuel fires (diesel, crude oil Av Gas etc). Jan explained that this foam gives rapid flame knockdown by developing an aqueous film on top of the liquid surface and so preventing, the vapours from re igniting. AR/AFFF (Alcohol Resistant) foams are ideally suited to tackle class B polar solvent liquid based fires such as ethanol, biodiesel and MTBE. This foam as Jan explained, develops a polymer film on top of the liquid fuel surface preventing reignition

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*Stack of straw bales. The stack on the right is coated with Sthamex class A foam and remains intact. Picture courtesy of Mark Bathard*



and protecting the bubbles from being absorbed by the alcohol.

Two more foams that Dr Sthamer know a lot about include fluorine free alcohol resistant foam. This is an environmentally benign product to fight class B hydrocarbon fires and polar solvent based liquid fires. Dr Sthamer have invested heavily in the development of fluorine free foams and are considered experts in this field. Finally, Hi-Ex High expansion foams are ideally suited for enclosed large scale class A fire types such as aircraft hangars, warehouses and ships engine rooms.

Now the time had come that everyone had been waiting for which was the visit to the fire ground. We all donned high visibility jackets and walked the short distance to the live burn area where we were given a brief by one of the Fire Service College instructors as to what was going to be demonstrated. First up was a pan fire with a solution of E85 ethanol which was lit and left to burn for a few minutes. To demonstrate that AFFF foams are not effective on Alcohols or Polar Solvents Dr Sthamer Sthamex AFFF1% was used to attempt to extinguish the fire but without any effect, during the demonstration, Jan Knappert explained that he knew this would not work until a solution of Dr Sthamer's new Fluorine Free Alcohol Resistant Moussol FF 3x6 was used and within 90 seconds the pan fire was out. The second demonstration also consisted of a pan fire but this time with a solution of diesel. Dr Sthamer Sthamex AFFF1% was again used for this scenario and I personally counted 30 seconds and the fire was

out. The next demonstration involved a small pile of tyres which were lit and left to burn for about 2 minutes. When they were fully involved, Dr Sthamer Sthamex AFFF 3% was supplied from a 35 litre Rosenbauer Poly CAFS trolley unit to extinguish the fire. The backdrop of the area where the demonstrations were taking place was an aircraft simulator which the instructors, armed with their nozzles, painted the fuselage with the remaining foam so the delegates could see how sticky the foam was in preventing re-ignition.

The next demonstration involved a car being set alight and the use of a Rosenbauer UHPS (Ultra High Pressure System) with Sthamex AFFF3% foam. Again, the fully involved fire was successfully extinguished in little time and with only a small amount of foam and water being used.

The "piece de resistance" were two stacks of straw bales each separated by about 1 meter. One stack was coated in Dr Sthamer Sthamex Class A Foam whilst the other was set alight. Being a fairly blustery day, the idea was to prove that the effect of the "adhesion" of Sthamer foam would prevent the stack with the foam on, from igniting. The wind blew the flames from the involved stack onto the other stack of straw with the foam coating. After about 5 minutes you would of had to of been looking through a microscope to detect any scorching on the bales with the foam coating.

All companies and visitors who attended the Fire Service College on this thoroughly enjoyable and informative day would like to extend their thanks to the college for their hospitality and the use of their facilities.

*For more information about any of the companies or to arrange another demonstration please contact:  
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Batley  
West Yorkshire WF17 5TA  
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# Heat Stress

## Ignore the signs at your peril

**By Jeffery  
W Petersen**

The warning signs of heat stress are still not recognized or are being ignored by many firefighters. Jeffery Petersen provides a checklist of physical symptoms and gives new data showing that the mental effects can be equally dangerous.

**H**eat stress refers to the combination of environmental conditions, metabolic rate from activities we do and clothing that we wear, which will increase our core temperature. Our body tries to achieve a balance between heat gain and heat loss, but it is when this balance is compromised that the body is unable to function at its optimal level, writes Jeffery Petersen.

The major source of heat gain is the internal heat generated through activity the body undertakes. Of the energy expended during this activity, only about 25 per cent is translated to mechanical work, the remainder being released as heat in the contracting muscle. The harder the human body has to work during a particular activity, the more internal heat is generated.

already be significantly reduced.

The rate at which people sweat is determined by three main factors – state of acclimation (acclimatization); aerobic fitness; and genetics.

Acclimation is a physiological adaptation that the human body makes with repeated exposures to heat stress during exercise; it increases our rate of sweat production, shortens the time it takes for sweating response to start and conserves sodium.

Some of the best-acclimated firefighters are breathing apparatus training officers because of the repeated exposures during hot fire training. Regular and sustained aerobic exercise can elicit a similar response.

Firefighters who maintain an adequate level of

**It does not matter how hydrated, how acclimated or how fit a person is – if the sweat cannot evaporate, then thermo-regulation will be compromised. It is therefore essential that firefighters are aware of the signs and symptoms of heat stress so that it can be identified early and the appropriate measures taken.**

The major avenue for heat loss is evaporative cooling through evaporation of sweat from the skin's surface. When heat balance is compromised, the body will try to direct the heat away from the core by increasing blood flow to the skin. At the skin surface, water secreted from sweat glands absorbs heat from the skin, changes from a liquid to a vapor and is carried off by the surrounding air. Because the heat of evaporation is quite high, small amounts of sweat remove relatively large amounts of heat.

It is well known in the Fire Service the world over, therefore, that to maintain normal body function; fluid must be replaced as soon as possible.

It is also well known that by the time somebody experiences thirst, they are probably already dehydrated and potential functional capacity will

fitness will have a reduced cardio-vascular strain and lower core temperature for the same level of heat stress. Fit firefighters also tend to have reduced levels of body fat, which means that they do not have to carry around extra (non-functional) weight, therefore requiring less energy to do the same job. Body fat is a very good insulator, which means that increased levels of body fat will compromise the body's ability to lose heat.

It does not matter how hydrated, how acclimated or how fit a person is – if the sweat cannot evaporate, then thermo-regulation will be compromised.

It is therefore essential that firefighters are aware of the signs and symptoms of heat stress so that it can be identified early and the appropriate measures taken.

At the first sign of any of these symptoms the Officer in Charge should be notified and appropriate action taken, including work/rest cycles instituted; keep cool and avoid radiant heat; drink small amounts of appropriate fluids; avoid coffee, tea and alcoholic beverages; use cooling devices such as water spray bottles, damp towels and fans. Ice packs are not recommended.

Although technology and training have played a significant role in reducing the number of deaths and injuries from heat strain, it is a danger that firefighters continue to face.

The physical effects of heat strain have been well documented. However, recent research shows that there is a further deleterious effect on the mental state of people suffering from heat strain, which is equally dangerous.

Heat strain has a direct effect on a firefighter's mental agility and his or her ability to make decisions. The mental symptoms are not as readily

identifiable in the heat of a large fire, but the consequences can be fatal. Research in this area has been led by the interest in reducing air force pilot error. Researchers found that the decision-making process is significantly hampered by the increased heat strain, with known consequences being decrement in mental performance, vigilance and eye/hand co-ordination.

Highly motivated heat stressed subjects exhibit a higher error rate, a narrowed attention span with neglect of secondary tasks and a diminished response to unusual events. The potential for injury to the individual and to those under his or her command is therefore much higher.

Stress limits for workers exposed to adverse thermal conditions have recently been challenged. Rather than basing exposure limits on a physiological criterion – i.e. increase in body temperature – it is suggested that changes in behavioral performance efficiency are a more sensitive reflection of human response to heat.

**The physical effects of heat strain have been well documented. However, recent research shows that there is a further deleterious effect on the mental state of people suffering from heat strain, which is equally dangerous.**

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Reducing the risk of heat strain will also reduce the incidence of cardiac strain. In the United States, approximately 50 firefighters die each year as a result of cardiac arrest. Improved technology to reduce the risk of heat strain could have a positive impact upon these mortality rates.

From general research and specific research undertaken at W. I. Gore and Associates (manufacturer of GoreTex waterproof and breathable fabric), we know that the inclusion of a breathable moisture barrier in a firefighter's ensemble can make a significant impact on reducing risk from heat stress to a firefighter carrying out moderate to light duties – i.e. 80 per cent of the normal workload.

Current technology is such that in the real extremes of temperature experienced when fighting a fire in an enclosed space, it is almost impossible to remove the build-up of heat from the body inside the protective clothing and, at

## Heat Cramps

**Symptoms:** Painful muscle cramps, especially in abdominal or fatigued muscles

**Signs:** Incapacitating pain in voluntary muscles

**First Aid:** Rest in cold environment; drink salted water (0.5 per cent salt solution); massage muscles

## Heat Syncope

**Symptoms:** Blurred vision (gray-out); fainting (brief)

**Signs:** Brief fainting or near fainting behavior; normal behavior

**First Aid:** Lie on back in cool environment; drink water

## Dehydration

**Symptoms:** No early symptoms; fatigue/weakness; dry mouth

**Signs:** Loss of work capacity; increased response time

**First Aid:** Fluid and salt replacement

## Heat Exhaustion

**Symptoms:** No early symptoms; fatigue/weakness

**Signs:** High pulse rate; profuse sweating; low blood pressure; increased gait; pale face; body temperature normal to slightly increased

**First Aid:** Lay down flat on back in cool environment; drink water; loosen/remove clothing

## Heat Stroke

**Symptoms:** Chills; restless; irritable

**Signs:** Red face; euphoria; shivering; disorientation; erratic behavior; collapse; unconsciousness; convulsions; body temperature more than or equal to 104° Fahrenheit (40° Celsius)

**First Aid:** Immediate; aggressive; effective cooling; transport to hospital

the same time, protect thoroughly from the outside.

For most of the work undertaken by firefighters, a moisture barrier will have a distinct effect, allowing them to work for longer without a rest, lowering the increase in body temperature and reducing the risk of errors through poorer mental performance. New research is currently aimed at creating up to date clothing technology that will offer these benefits in the most extreme temperatures. **IFF**

**Jeffery Petersen** is an Australian freelance writer and a former 8-year veteran firefighter now living in Indiana, USA



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# Draeger Safety, An in depth look

## Focusing on firefighters with technology for life

As manufacturers of a wide range of respiratory protection and gas detection systems for use in firefighting and industrial applications, Draeger prides itself on having innovation as its theme.

**B**y working closely with its customers and understanding the complexities of hundreds of very different applications, Draeger has been able to develop products that not only meet the needs of today's users but which can be further enhanced to meet the needs of the future.

Innovative in design, Draeger's revolutionary, complete system solution for firefighters is a prime example of how firefighting equipment can be designed to meet future needs. Combining modularity with state-of-the-art technology to bring a completely new dimension to personal protective equipment, it incorporates the latest in compressed air breathing apparatus, full face masks, head-up-displays, quick-cylinder connection, electronic monitoring as well as customised training. For maximum operational benefit, the system can be put together as a series of mix-and-match components to meet different operational requirements.

Required to work in the worst possible environments, firefighters know that although the conditions may be unexpected and uncontrolled, the risks

to their own personal safety can be significantly reduced through effective training and safety preparedness. Wherever the threat occurs and whatever form it may take, if firefighters are trained to deal with the unexpected and have the right equipment to help them to overcome the hazards they may face, their safety can be significantly improved.

The new Draeger PSS 7000 Breathing Apparatus, for instance, can be used with the new Draeger FPS 7000 Full Face Mask and the new Bodyguard 7000 Electronic Monitoring Unit to bring a pioneering, total solution that offers maximum protection. It can also be used with the advanced PSS Merlin entry control system and FPS Com, a new fully integrated speech radio with voice amplification option.

Breaking new ground in terms of design, the Draeger PSS 7000 combines a wide range of features to maximise comfort and minimise both stress and fatigue. The new harness, for example, features advanced compression moulded comfortable padding that combines high temperature



performance with exceptional wear resistance. A high grip, anti-slip surface ensures that the harness stays in position and the set remains secure on the body, whilst a quick release mechanism on both the waistbelt and shoulder harness allows quick and easy detachment for easy cleaning and maintenance.

The Bodyguard 7000 is a sophisticated electronic monitoring unit boasting advanced technology as well as an ergonomic design. Providing continuous monitoring of the operational status of both the firefighter and the BA, it improves firefighter safety as well as comfort and performance. Utilising simple, user-friendly push button controls to provide fast access to essential information, the gauge incorporates an improved visibility LCD display that provides accurate and continuously updated data in an easy to read format. This includes the time-to-whistle display which is a dynamic calculation based on current air consumption, digital pressure reading in bar, and a simulated analogue gauge. With integrated ADSU and manual distress alarm, it also performs automatic self tests and system tests and emits both visual and acoustic alarms. For maximum flexibility, it is also offered with a choice of operating modes: Tally and Automatic.

Accurate and fast, the Draeger PSS Merlin incorporates an entry control board, the Bodyguard 7000 and a portable radio unit attached to the firefighter's BA set. Using radio technology to continuously transmit and receive data from up to 12 individual firefighters (on each control board) simultaneously, this self-contained, state-of-the-art electronic system is able to remotely monitor their exact status and safety from outside the incident. As a result, and unlike traditional manual or semi-manual systems, the PSS Merlin provides Entry Control Officers with a continuously updated supply of vital information, thereby enabling them to react immediately in an emergency.

Benefiting from Draeger's extensive knowledge and experience in the design and manufacture of

ergonomic, comfortable and high performance breathing apparatus, this comprehensive System Solution also boasts Draeger's advanced pneumatics as well as its proven modular capabilities. The effortless assembly and disassembly of all major components means that not only can the system be configured rapidly, but easy care and maintenance will guarantee quick turnaround times in the workshop and, as a result, ensure that every part of the system is always ready for use.

Further improving visibility in poor conditions, the new FPS 7000 Head-Up-Display can also be linked into the system, as can the fast, efficient Cylinder Quick-Connect option. Training, which can be customised to meet exact needs, can then be added as a further component in the fight to keep firefighters safe.

Offering a further opportunity to enhance the system to meet specific needs, the innovative Draeger UCF Thermal Imaging Cameras are suitable for use in the harshest operating environments. Using the very latest sensor technology to ensure sharp, detailed, high-contrast thermal images and direct temperature readings, it has been specifically designed to meet fire industry requirements.



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Combining excellent build quality with outstanding performance, these small, lightweight, robust cameras have also been ergonomically designed to ensure easy handling.

Together with cooling vests, chemical protective suits, helmets and a wide range of gas detection systems, these firefighting essentials mean that Draeger can provide a wide range of firefighting equipment to suit just about every firefighting need.

### **Technology for life**

Founded in 1899 and employing over 350 people in the UK, Draeger believes that innovative forward thinking and a strong customer focus are central to its success. These core principles allow the company to remain faithful to its values, respond to the requirements of the market and meet customer needs for protection and safety.

Offering unique solutions from the development of the first carbonic acid pressure reducing valve by Heinrich Dräger in 1899, to the DraegerMan PSS range of Compressed Air Breathing Apparatus around 100 years later, Draeger has never lost sight of the need to meet customer requirements. The development of the revolutionary DraegerMan PSS Merlin Telemetry system which allows up to 12 firefighters to be monitored from outside an incident bears testimony to that, as does the latest range of innovative Draeger X-am personal gas detection instruments which are as small as a mobile phone.

The Draeger philosophy of Technology For Life has ensured that the company never loses sight of its goal – creative design, high quality performance and practicality in use.

Every year, Draeger invests around five percent

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of its sales revenue on research and development. In addition, the sophisticated in-house research department continually works with different engineering and scientific disciplines in a variety of national and international projects. Technology scouting and joint studies with scientific institutions also ensure the ongoing identification and monitoring of relevant fields of technology.

This international approach has also led to the development of more and more products that are specifically designed with the user in mind. For instance, extensive work studies with the Rotterdam Fire Brigade led to improvements in the ergonomics of compressed air breathing apparatus whilst both on and offshore gas detection systems have been significantly enhanced by studying customer feedback.

Providing a comprehensive selection of products and systems solutions for every conceivable customer requirement, each of the Draeger products combine ergonomics and wearer comfort with user safety and a modern, practical design. They are also designed to be cost effective, durable

and easy to use.

Whether protecting against dusts, gases and vapours, chemical attack and other atmospheres that may be hazardous to health or where life cannot be sustained, the Draeger range has something for everyone.

In 1930, for instance, Auguste Piccard was the first person to fly into the stratosphere in a light metal balloon using Draeger apparatus and Draeger oxygen equipment was used by Sir Edmund Hillary and Tenzing Norgay when they became the first people to conquer Mount Everest. Marine researcher Jacques Cousteau has also relied on innovative Draeger technology back in the 1950's.

Today, Draeger systems can be found in a wide range of industries from construction, firefighting and freight through to mining, oil and gas, petrochemicals, process control and water and waste treatment – wherever, in fact, a potentially airborne hazard may exist.

Fully supported with the Draeger Total Care programme which combines cost efficiency with ease of mind, the range includes half-mask and full-face masks, powered air purifying respirators, compressed air breathing apparatus, personal escape systems, electronic monitoring units and telemetry systems. Portable gas detection instruments, fixed gas detection systems and chemical protection suits are also included, as are alcohol breath test systems and diving apparatus.

IFF

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INTERNATIONAL FIRE FIGHTER

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# Storage Tank Fire Protection - Leave Nothing To Chance

There is no disputing that fire safety is a major concern throughout the petrochemicals industry. However, no matter how much effort goes into preventing storage tank fires, they do occur and, when they do, it is best if nothing has been left to chance. Thierry Moinet, EMEA Business Development Manager Foam & Hardware at Tyco Fire Suppression & Building Products, explains.

**By Thierry Moinet**

EMEA Business Development Manager Foam & Hardware, Tyco Fire Suppression & Building Products

If a storage tank fire breaks out, the site operator really has a choice; he can adopt a controlled burn strategy, or the blaze can be tackled.

In reality though, the controlled burn approach is an option only when: firewater run-off would cause significant pollution to sensitive environmental receptors, such as surface and groundwater extraction areas; the site is remote from population centres or a controlled burn is the best solution for air quality; when the site is not capable of containing the required quantities of firefighting water and foam; or when there is a significant risk to firefighter safety. It is certainly not an option when: smoke plumes could be a risk to public health, or large areas may require

evacuation; there is a significant risk of the fire escalating; or when the burn-out strategy may require major transport routes to be closed, with its own attendant risks.

In most cases, of course, allowing a storage tank fire to burn out is simply unacceptable on environmental pollution grounds. When the strategy is adopted, it is often not so much a pre-determined management decision; invariably, it is the result of not having the essential firefighting measures in place and there being no other choice. Indeed, it could be argued that some storage tank fires have been a combination of both strategies. Take, for example, the Buncefield storage tank fire in the UK. While it was eventually



extinguished, it undoubtedly burnt for longer than it would have had effective firefighting measures and safety protocols either been in place or properly implemented.

Interestingly, the final report of the Buncefield Standards Task Group entitled *Safety and Environmental Standards for Fuel Storage Sites*, contains advice that all of us with a part to play in the petrochemicals fire safety should heed. This includes determining the amount of foam concentrate and water that will be necessary to fight the worst-case scenario – and the key term here is “worst-case” – which should surely mean a conflagration that engulfs the entire site. Interestingly, the report also stresses the importance of assessing whether the necessary foam stocks are available on site and, if not, how quickly these stocks can be brought to the site and by whom; in particular, what arrangements have been made with foam manufacturers and/or neighbouring sites.

At Buncefield, the foam stocks on site were wholly inadequate, and it was only through the herculean efforts of organisations such as JOIFF (Joint Oil & Industry Fire Forum) and its member companies that the essential foam concentrates and hardware was hastily brought to bear. In response Tyco, for example, implemented a policy of strategically locating stocks of foam concen-

trate that are sufficient to meet any eventuality; ensure fast response, continuity of supply, technical support, engineering know-how, manufacturing resources and industry expertise. The siting of these stocks is under constant review and they are relocated as and when it is necessary to reflect local supply and availability conditions, and customers’ updated risk assessments and contingency plans for each site.

#### Foam stocks & fast response

The effectiveness of this solution to ensuring that, as the Buncefield report puts it: “...the necessary foam stocks are available on site” by one means or another is illustrated by the events surrounding the recent storage tank fire at the Harouge Oil Operation petrochemical and refining complex at the Ras Lanuf Terminal in Libya.

The Harouge Oil Operation is a joint venture between the National Oil Corporation of Libya (NOC) and Petro-Canada, Canada’s fourth largest oil producer and refiner. In August of this year, during routine maintenance, a fire broke out in a 450,000 barrel oil-storage tank; one of 13 oil storage tanks on the site with a total capacity of 6.5 million barrels.

To ensure that an adequate stock of foam concentrate was available on site to meet any

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eventuality that might develop, Calgary-based Petro-Canada immediately sought help from OSRL (Oil Spill Response Limited) in Southampton. With a brief to source 200,000 litres of foam concentrate and arrange its urgent delivery to the Ras Lanuf Terminal, OSRL contacted every major foam supplier in the UK and mainland Europe and discovered that Tyco – thanks to its strategically

requirement in the event of a fire.

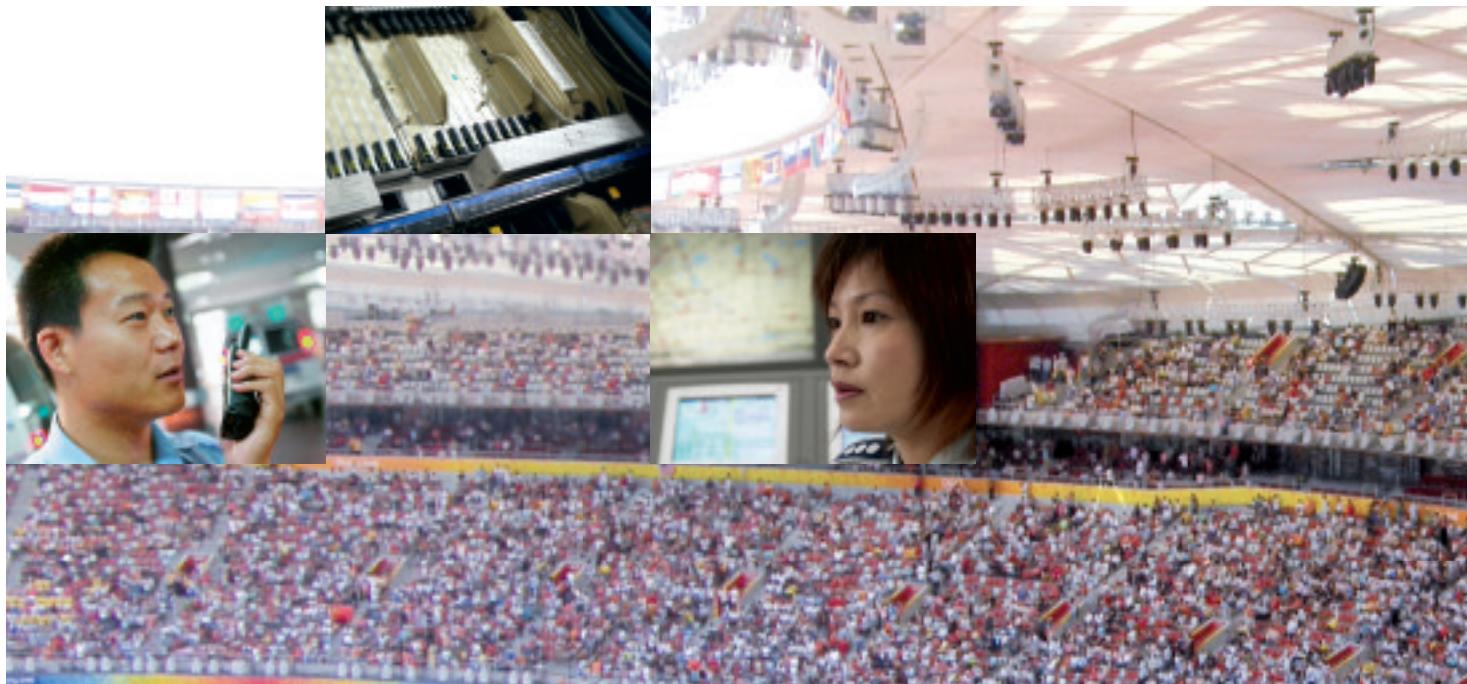
The Williams/Tyco team put into action an emergency response package that, in addition to ensuring adequate foam stocks on the ground, resulted in considerable savings in the airfreight costs and simplified on-site logistics. This required foam concentrate to be express supplied from the Tyco emergency response stocks in Spain and the

## **The Harouge Oil Operation is a joint venture between the National Oil Corporation of Libya [NOC] and Petro-Canada, Canada's fourth largest oil producer and refiner.**

located stocks – was the only one with the capability to immediately meet the demand. That same afternoon, talking to Kelvin Hardingham, European, Middle East, Africa, India and Russia Manager for Williams Fire and Hazard Control Inc®, OSRL learned that three years previously – at the request of the Harouge Oil Operation's fire chief – he had produced an outline report setting out recommendations for the site's foam stock

Netherlands, despite it being a national holiday period in Spain and a weekend in Libya.

The original request, channelled through OSRL, was for 200,000 litres of 3% foam concentrate. However, the Williams/Tyco solution was for an equivalent quantity – 80,000 litres – of its 1% THUNDERSTORM® ATC (Alcohol Type Concentrate) 1x3 AFFF foam concentrate that was developed jointly by ANSUL® and Williams Fire



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and Hazard Control. THUNDERSTORM is three times as concentrated as regular 3% foam; it uses new and proprietary technology, it is specifically designed to fight fires in oil refineries, and is formulated to ensure the fastest, most reliable and safest extinguishing of a fire.

By the end of the same day, 40,000 litres were ready for despatch from the Madrid emergency stocks and 40,000 litres from Enschede in Holland, and were air freighted the following morning on the next available flights. The original plan was to use Vatry airport in northeast France and Madrid International, however the tragic Spainair accident a few days earlier made this impossible and the Spanish load was diverted to Malaga airport. Even so, the required amount of foam concentrate arrived in Libya within 24 hours of Williams and Tyco being alerted.

This is by no means the first time that the ready availability of strategically located emergency stocks of foam concentrate has averted a potential disaster within the petrochemicals industry. Shortly after the emergency stockholding policy had been implemented, one of BP's huge petrochemical storage tanks at the Port of Amsterdam terminal in the Netherlands threatened to erupt into flames. The first consignment of foam was on site within just three hours of the emergency being declared by BP.

### Integrated solutions

Fixed foam systems are undeniably the best method of protection for storage tanks because they do not demand the hasty marshalling of emergency equipment and manpower. Much has been written on the various techniques since SKUM™ developed the first reliable storage tank fire protection solution almost 60 years ago. Today, SKUM brand systems are available for cone roof and fixed roof tanks, open-top floating roof tanks, covered floating roof tanks, and horizontal tanks.

However, storage tank fires – again, Buncefield is a typical example – invariably start with an explosion that may seriously damage the tank structure and nullify the effectiveness of foam generators used in fixed or “over-the-top” systems. This has led to the more widespread use of the less vulnerable sub-surface injection and semi-subsurface injection systems for applications where there is sufficient water pressure available for their use.

In sub-surface systems, foam is introduced close to the bottom of a tank through a separate foam line and then floats to the surface to spread and extinguish the fire. However, this technique is not used on gasoline blends that contain alcohol or other polar solvent additives as oxygenates, as polar solvents destroy the foam, even where alcohol-resistant concentrates are





used. Sub-surface injection also cannot be used on cone roof tanks with internal floaters, in accordance with NFPA (National Fire Protection Association) 11 (*Standard for Low, Medium and High-expansion Foams*). The semi-subsurface injection technique overcomes this problem. It can be used for all types of fuel and has all of the benefits of sub-surface injection. This technique uses a flexible hose that is filled with foam under pressure. When the system is activated, the hose floats from the bottom of the tank to deliver the foam to the surface.

Fixed monitors are now available with delivery capabilities that span from 1,000 litres-a-minute up to more than 20,000 litres-a-minute and have shown to be a cost effective method of protecting relatively small storage tanks and associated spill or ground fires. Also, the availability of remotely-operated monitors with electrical or hydraulic control systems and exceptional throw performance are now enabling firefighters to remain at a safe distance from the blaze (Distance is safety). This has resulted in monitors being used successfully to extinguish fires in larger diameter tanks, using high-flow devices and large diameter fire hoses.

Horizontal storage tanks have been known to rupture following an explosion, so it is vital to ensure that the bund area is adequately protected. Even for larger bund areas in major tank farms, fixed low or medium-expansion generators can be

used to create an effective foam blanket, with any remaining fuel in the tank being protected using a monitor. Monitors can be used to protect the bund area, but this leads to much higher foam consumption, and the recommendation is for at least two monitors to protect larger bunds to ensure complete coverage and the effectiveness of the equipment in all wind conditions.

Turning to the Buncefield report once again, it reinforces the importance of determining the wind direction because the monitors should be placed to allow the wind to carry the foam to the fire, and changes in wind direction will have to be accommodated in the plan. The report also stresses the need to decide how many and what size monitors are necessary; an assessment that obviously needs to take into account the area at risk and the application rates required to secure and extinguish this risk.

Finally, the 118-page report has a word of caution about the need to ensure compatibility when hardware is brought from a variety of sources, which surely underpins the wisdom of sourcing the foam firefighting agent and delivery system from one supplier. This is an argument long expounded by Tyco that, in addition to THUNDERSTORM, offers an array of brand foam concentrates, SKUM brand foam delivery systems, fixed foam generators and fixed and portable monitors.

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# Safer by Design

**By Alec Don**

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We all hope that we shall never have to call out the fire brigade to save our lives and property, and it is perhaps only when we do that we can really appreciate the bravery of our firefighters as they enter the building we may have just been glad to escape.

**B**ut although it is an inherently dangerous job, what is not so well appreciated is the mundane fact that 70% of reportable injuries to firemen arise as a result of the mundane-sounding activities such as lifting or carrying, or slipping. To get into these statistics, an accident usually has to be serious, so one can only imagine what additional plethora of minor scratches and bruises and pinched fingers may occur every year as firefighters go about their daily business.

Analysing all the causes of these injuries is a lifetime's work – in some cases maybe the fireman

should have just been more careful, but in many others it may genuinely be the case that every day equipment is badly designed or laid out, and no single piece of equipment is more important than the fire truck. It is the means of transporting the fire fighter and all of his or her equipment to the fire scene, and once there the firefighter needs to be able access the life saving tools of the trade without being injured in the process.

Surprisingly the safety inherently designed into fire trucks and their locker compartments can vary enormously from territory to territory. Increasingly

**Increasingly a lot of attention is now being given to improving the locker designs, both to reduce the risk of injury and to increase operational effectiveness, and much of this is to do with the choice of components.**

a lot of attention is now being given to improving the locker designs, both to reduce the risk of injury and to increase operational effectiveness, and much of this is to do with the choice of components. For example drawer carrying too much weight relative to the strength or specification of the drawer components can pose a number of injury risks:

- The drawer opens with excessive momentum and, because the ballbearing slide carrying the drawer is the wrong type, the drawer smashes through the end stops causing serious injury to the operator
- The slide mechanism simply breaks, for example as the load (eg a portable pump) is dropped back onto the drawer, again with the risk of serious injury to the operator
- Even if there is no risk of the drawer and its slide mechanism failing, an overloaded drawer slide can require too much force to open or close, and this may cause back injuries and other strains.

**The use of cold drawn steel (as opposed to cold rolled) with both principal and reinforcing bearings enables fire truck builders to standardise on a strong and cost effective slide component for whatever drawer function is envisaged, based on very high resistance to damage from shock and vibration, and end-stops and beam profiles that do not fail when exposed to arduous conditions over the life of the vehicle.**

- It can also be the case that placing too much equipment on one drawer can make a particular piece of equipment hard to find and access.

The problem of overloading of drawers is of course best addressed by very careful pre-planning by the fire department of exactly which pieces of equipment go into which lockers and onto which drawers, and commensurately increasing the number of drawers to ensure that every piece of equipment is rapidly and safely accessible. This has the added benefit that after attending a fire emergency, it is easy for the crew to put the equipment back on the vehicle and check that nothing has been forgotten or lost.

The use of cold drawn steel (as opposed to cold rolled) with both principal and reinforcing bearings enables fire truck builders to standardise on a strong and cost effective slide component for whatever drawer function is envisaged, based on very high resistance to damage from shock and vibration, and end-stops and beam profiles that do not fail when exposed to arduous conditions over the life of the vehicle.

By standardising on a stronger slide the vehicle builder can work with the fire department customer on a new or non-standard drawer design with the certain knowledge that the components will be fully fit for purpose, reducing the engineering time taken to tailor a compartment design

without the usual costs of bespoke manufacture, as well as specifying components that match the life of the vehicle.

Stronger and better slides are however only one part of the picture. Inappropriate locking mechanism design will cause fire operators to put their hands near moving components posing a substantial risk of pinching and other similar injuries. If such latches are also mounted at the edge of a drawer then the operator may not have both hands in a position to control the movement of the drawer – many drawers are located at head height, and some of these latch designs are used in conjunction with unguarded angle-iron increasing the risk of injury as well as the potential seriousness of the injury.

These are all risks that can and should be designed out of the vehicle. Probably the safest design entails fitting the drawers with a double front drawer handle with a central unlocking plunger. The locking mechanism is designed to interact with modular glass reinforced plastic slide

and tilt mounting brackets, to deliver a number of key advantages in safe locker design:

- The operator has good and positive control of the movement of the drawer, with no risk of damage to fingers from loads inside the drawer that could slide forward as the drawer is opened and tipped down.
- The handles are glove safe, and hands are kept well away from moving components and pinch risks.
- The drawer self locks as it is pushed closed.

The use of these modular components to create slide out drawers and slide out and tip down drawers has been accompanied by the increasing use of high quality positive lock and friction lock tool mounts inside the drawers and storage compartments. These enable tools and other vital equipment to be held securely and remain undamaged as the vehicle travels to the emergency scene, and once there crews that have been trained on the location of every tool on the vehicle can swing quickly and efficiently into action.

Paul Beard, Fleet Manager at Avon Fire and rescue Service told us:

"Over the past few years we have got much more involved in pre-planning the layout of the lockers on our fire trucks, and there have been undoubtedly benefits for us both in terms of reducing our injury rates, but also in terms of improving



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our overall fire-fighting capability.

Our suppliers have done a fantastic job in terms of helping us to specify better and safer drawer systems."

Fire departments in other territories such as the USA, India and South Africa are increasingly looking outside their home territories for good design ideas and components wherever they may be found. Michael Wilbur of the New York Fire Department and one of the USA's leading trainers on safe vehicle driving techniques told us

"We have a lot of diversity in the physical size and strength of individual fire fighters, particularly with growing numbers of females joining departments, and we are currently commissioning some extensive studies on the challenges this sets us on the design of equipment – simple issues like the step heights on ladders and the height and weight of compartment drawers.

We are now having a close look at the range of components being used on our fire trucks compared to other territories such as the UK, and the approach these components embody towards safer better vehicle design."

## **Fire departments in other territories such as the USA, India and South Africa are increasingly looking outside their home territories for good design ideas and components wherever they may be found.**

Better vehicle design will not eliminate all accidents but the vehicle lockers and drawers are possibly the most important point of interaction between fire fighter and vehicle. It unquestionably makes sense for fire departments to put more time into pre-planning the layout of these compartments and to invest in better components to improve vehicle and fire fighter performance and vehicle life.

The components – which include glass reinforced plastic slide and tilt brackets that are actually stronger than their steel forbears, cold drawn steel dual bearing reinforced telescopic slides, strong glove safe handles and locking mechanisms and high strength positive locking tool mounts – are all selected to deliver better vehicle and operator safety and – ultimately – fire fighting performance.

If that means that the fire fighter who bravely walked into the building we just escaped also walks out again because he was able to get there just that little bit sooner and with the right equipment, then that is unquestionably a good thing.

### **Thin and weak – cold-rolled-steel slides pose a danger**



Slide failure can cause fatal injury. This slide deformed and the end stops failed with the result that the heavily loaded drawer fell outwards. Switching to cold drawn steel reinforced slides largely eliminates such risks.

### **Operator safety designed out**



With no handle on the front of the drawer the Operator has to hold the drawer face with his or her fingers inside the drawer and therefore at risk from loose loads.

The draw lock is located at the edge of the drawer adjacent to the weak cold rolled sliding mechanism posing a significant pinch risk to the operator. It also forces the hands into positions where they do not naturally have good positive control of the drawer movement

### **Operator safety designed in**



In this slide and tilt configuration the drawer is fitted with a strong double-hand front handle with push button lock, giving the operator a glove safe handle, and excellent central hold with which to control the movement of the drawer. In addition all the contents of the drawer will be securely held in position against vehicle and drawer movement using positive and friction-lock tool mounts. **IFF**

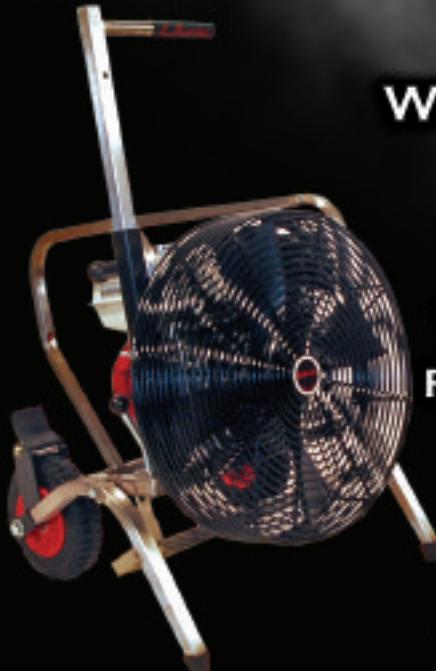
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# Life Preserving Standards

Standards covering protective clothing first began in the 1980s. Up until then garments used by first responders did not give consistent protection. So following an incident involving leaking chemicals from a railcar, the National Transportation Safety Board in the US recommended that government agencies support the development of protective standards. The result was the preparation of standards NFPA 1991 and NFPA 1992 by the National Fire Protection Agency (NFPA), the agency that issues standards for protective clothing for the fire service and first responders of all kinds.

**By John Eklund**

Trelleborg Protective Products

**N**FPA 1992 addresses the second tier of hazardous materials response protection. It focuses on chemical liquid splash protection, short-term intermittent contact with non-hazardous (skin-toxic or carcinogenic) chemicals that do not produce vapours.

The highest level of protection is covered by NFPA 1991. Its primary purpose is to specify protective clothing that isolates the wearer from a hazardous chemical environment that surrounds them. Complete ensembles, a suit with attached gloves that totally encapsulates the wearer including their breathing apparatus, are always thought to be required in these circumstances. With a stringent test, these are evaluated for permeation resistance to both liquid chemicals and gases. The passage of this media through the ensemble material is measured at a molecular level using analytical equipment.

Testing incorporates:

- Permeation testing of suit, visor, glove, and footwear materials along with their seams.
- Test for resistance against a battery of 24 chemicals containing gases and liquids, including five warfare agents.
- Inflation of ensembles to determine integrity against gas penetration.
- A "shower-like" test for demonstrating integrity of clothing against liquid penetration.
- Burst strength, puncture/tear resistance, low temperature performance, abrasion resistance, and flex fatigue testing of suit, glove, and footwear materials.
- Break strength testing for seams and closures.
- Leakage and mounting strength testing of exhaust valves.
- Evaluation of the functional use of the ensemble and dexterity of gloves.
- Additional options cover protection against liquefied gas and flash fire.

*Complete ensembles including breathing apparatus are required to meet NFPA and European standards*



Also of relevance to protective clothing are levels of protection, originally developed for respiratory equipment, defined by the US Environmental Protection Agency (EPA). These go from A through to D, where D is the lowest and A the highest level of protection.

Level D applies when there are no contaminants and splashes, immersion, or where the potential for unexpected inhalation or contact with hazardous levels of chemicals can be prevented within the working area.

Level C protection is required when the concentration and type of airborne substances is known and the criteria for using air-purifying respirators are met.

Level B protection applies when the highest level of respiratory protection is required with a lower level of skin protection. The main difference between Level C and Level B protection is that

atmospheric concentrations and other selection criteria permit wearing of an air-purifying respirator. Equipment therefore includes positive-pressure, full face-piece self-contained breathing apparatus (SCBA) or positive pressure supplied air respirator with escape SCBA, inner and outer chemical-resistant gloves, face shield, hooded chemical resistant clothing, coveralls, and outer chemical-resistant boots.

Level A protection is required when the greatest potential exists for exposure to hazards and where a very high level of skin, respiratory, and eye protection is needed. Clothing and equipment includes positive-pressure, full face-piece self contained breathing apparatus (SCBA) or positive pressure supplied air respirator with escape SCBA, totally encapsulated chemical-and vapour-protective suit, inner and outer chemical-resistant gloves, and disposable protective suit, gloves, and boots.

There are no standards linked to the EPA level of protection except for NFPA 1992 which equates to EPA level B and NFPA 1991, corresponding to level A. These standards are voluntary and there is no legal obligation for users and manufacturers to comply. However, in order to obtain federal grants for Chemical Protective Clothing (CPC) procurement, compliance with the applicable NFPA standard is usually required. Independent institutes and laboratories such as the Safety Equipment Institute (SEI) and Underwriters Laboratories (UL) manage certification and approval to NFPA standards.

In Europe the basic requirements for all Personal Protective Equipment (PPE) on the market are outlined by directive, 89/686/EC. This requires CE marking and for this purpose products are divided into three different categories. Category 1 is PPE of simple design, for example sunglasses. Category 2 is "intermediate", everything that is neither 1 nor 3. CPC belongs to Category 3 for PPE of a complex design that protects against serious risks.

Harmonisation of the specific requirements evolved within CEN, the European standardization organization. A series of classifications for different types of CPC and levels of protection were devised.

Classification number	Type	Product standard	Test to define type
1	Gastight top level of protection from solids, liquids and gases	EN 943-1	EN 464 pressure test
1a	Gastight, breathing apparatus worn inside a protective suit	EN 943-1	EN 464 pressure test
1aET	Type 1a for emergency teams	EN 943-2	EN 464 pressure test
1b	Gastight, breathing apparatus worn outside the suit	EN 943-1	EN 464 pressure test
1bET	Type 1b for emergency teams	EN 943-2	EN 464 pressure test
1c	Gastight, air fed suit (breathable air fed into the suit; no breathing apparatus)	EN 943-1	EN 464 pressure test
2	Air fed suit (see 1c) but not gastight	EN 943-1	EN 464 pressure test
3	Liquid-tight protection	EN 14605	EN 463 jet test
4	Spray-tight protection	EN 14605	EN 463 spray test
5	Protection from particles	EN ISO 13982-1	EN ISO 13982-2
6	Low exposure/risk protection from liquids	EN 13034	



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	USA	Europe		
Standard	NFPA 1991	EN 943-1	EN 943-2	
<b>Test Chemicals</b>	24 Specified	At least 2 none specified 15 Specified		
Liquids	19	12	3	
Gases	6			
<b>Chemical resistance test method</b>	ASTM F739	EN 374-3 or EN ISO 6529		
<b>Detection limit of permeation test</b>	0.1 µg/cm <sup>2</sup> /min	1.0 µg/cm <sup>2</sup> /min		
<b>Preconditioning of primary suit materials prior to permeation test</b>	Flexing & abrasion	None		
<b>Duration of permeation test</b>	At least 60 minutes	10 minutes	30 minutes – if failure – include note in manual	
<b>Test temperature or chemical permeation resistance test</b>	+27°C (+81°F)	+23°C (+73°F) or 20°C (+68°F)		
<b>Chemical resistance test of zipper/closure</b>	Penetration resistance for 60 minutes after 50 opening/closing cycles	None	Penetration resistance for 5 minutes	
<b>Warfare agent resistance</b>	Chembio testing with 5 agents for minimum of 60 minutes at +32°C (+90°F)	None		

These are detailed above with relevant standards.

The PPE directive is implemented through national legislation and monitored by an authority in each member state. For category 3 PPE, third party approval is required. Notified bodies, test institutes that are accredited for performing compliance testing and approval of PPE, perform this. To achieve CE marking not only is product examination and approval needed but also manufacture by a quality control system according to the PPE directive and ISO 9000, as approved by a notified body. Alternatively, the manufacturer can make an agreement with a notified body for sampling and testing of the PPE being produced at regular intervals.

There is a relationship between the European and American standards with NFPA 1991 relating to levels 1 and 2 of the European standard for gastight and air fed suits. However the American tests are more stringent with a minimum breakthrough time of 60 minutes, where EN 943-2 stipulates 30 minutes and EN-943-1 only ten. More importantly are the detection limits for permeation rates. For NFPA 1991 these are ten-times more challenging at 0.1 µg/cm<sup>2</sup>/min versus 1.0 µg/cm<sup>2</sup>/min for the European standards. In addition, for NFPA 1991, testing is against a larger battery of chemicals at higher temperatures, includes resistance testing against warfare agents and additional flexing plus abrasion prior to testing. Also, like in Europe, manufacturers' quality control systems are regulated for NFPA 1991, with yearly checks on facilities.

More details are included in the comparison above.

When choosing an ensemble there are a number of other factors linked to the standards that should be considered. Firstly will an ensemble with over cover, outer gloves and boots be necessary to meet both NFPA 1991 and EN standards. Generally this is the case. However, with advanced material technology a number of manufacturers can achieve the European standards with a single layer, significantly enhancing manoeuvrability and

comfort. Due to the much higher demands of NFPA 1991 there are few single skin, one layer ensemble certified to this standard.

Other considerations when selecting an ensemble are reusability and limited use. Limited use CPC can be made just of plastic laminate, are of a relatively low strength, typically 250-300 N, limited durability with flex cracking at less than 5000 cycles and cannot be decontaminated or even hygienically cleaned.

A reusable suit must be made of rubber or rubber plus plastic laminate on woven fabrics. This must be strong with a tensile strength typically between 1000 and 1500N. It should demonstrate durability and resistance to flex cracking over 50,000 to 100,000 cycles, be flame retardant and capable of decontamination. To conform to higher standards the use of reusable as opposed to limited use suits is recommended.

Additionally there have been recent concerns about ensemble storage life. The NFPA standards require that a statement regarding ensemble storage life be included in user information. The Safety Equipment Institute (SEI) has become aware that for some ensembles manufacturers are claiming indefinite storage life. The SEI is therefore advising that statements such as 'unlimited storage life' or 'indefinite storage life' are not acceptable unless they can be substantiated. They also state that this evidence should be made available on request.

Finally, and importantly for any employer to note, is that much legislation requires them to provide their workers with the 'best level of protection available'. If it can be shown that this was not done then the employer may be liable to compensate for any injury that a higher level of PPE would have prevented. Generally, as in many first response situations the risks are unknown, this means that PPE certified to both European and US standards is recommended. In this way an employer can then be certain that they have covered all eventualities.

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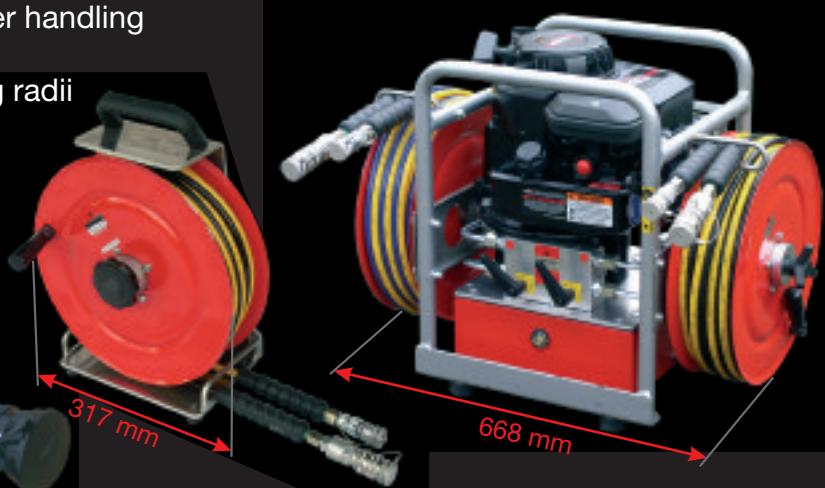
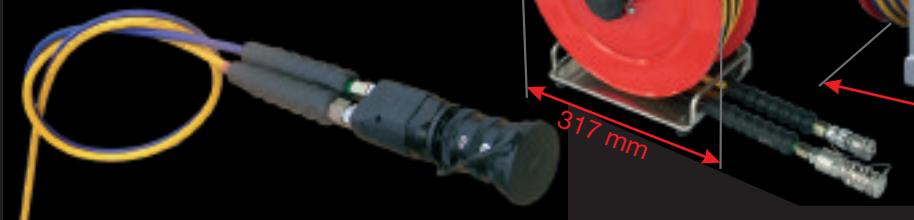
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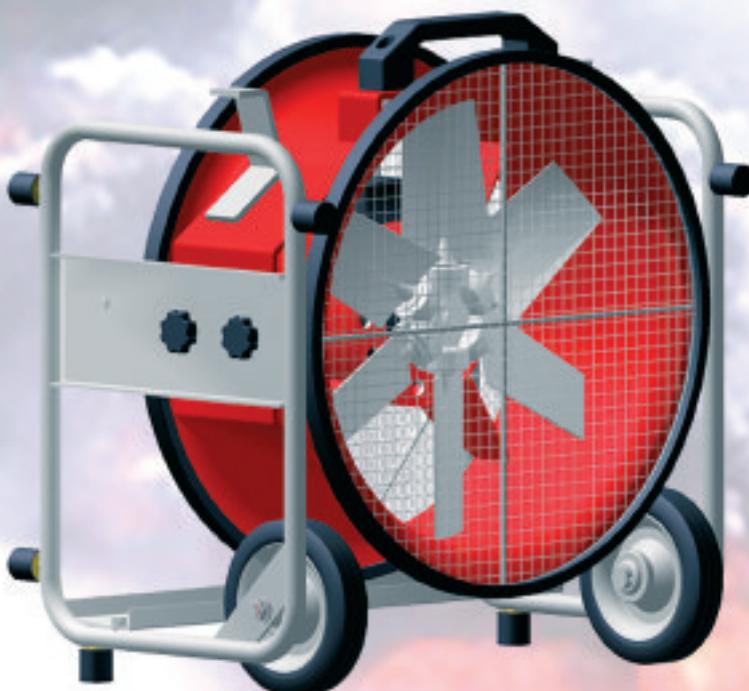
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# Selecting and Placing Gas Detectors for Maximum Application

**By Dave Opheim**

Detector Electronics  
Corporation

Many industrial processes involve dangerous gases and vapors: flammable, toxic, or both. With the different sensing technologies available, and the wide range of industrial applications that exist, selecting the best sensor and locating them properly for the job at hand can be a challenge.

To ensure a high level of safety, know the latest sensing technologies, which technology is best for the application, and where detectors should be installed for maximum protection.

## General Introduction to fixed gas detection

Portable gas detectors are small, lightweight, and move with the user; many are disposable. Fixed gas detection systems, on the other hand, are designed for installation at a stationary location and are expected to provide long-term service life and protection. This article addresses fixed gas detection only. Three main types are generally offered: point-type, open-path, and analytic or sampling detection systems.

### Point-type gas detectors

Point-type gas detectors can be fitted with either combustible or toxic gas sensors. These detectors monitor a specific area or point within the facility and must be strategically located for early detection of gas. These detectors require calibration for the gas type to be detected. Point-type detectors also must be routinely inspected to ensure they are capable of performing as expected.

**Open-path or line-of-sight gas detectors**  
Open-path, or line-of-sight, gas detectors monitor the presence of combustible hydrocarbon gases within a beam of infrared light projected between a pair of modules. To ensure that the gas/vapor hazard passes through the light beam, the modules must be strategically located and properly aligned. As with point-type detectors, open-path detectors must be calibrated for the gas type to be detected. Typically, open-path detectors are self-monitoring in the case of a blocked light beam or similar trouble.

### Analytic/sampling gas detection systems

Many point-detection and analytical instruments use a sampling system technique to extract an air sample, direct the sample to a sealed sensor where



*Point gas detectors detect gas in the air within a defined radius of their sensor*

it is analyzed, and then exhaust or return the sample to a safe location. Sampling system components typically include a vacuum pump, sensor(s), flowmeters, filters, and flow control elements. They are generally mounted on a subplate installed within an enclosure with compression fittings for sample tubing connections.

### Gas Alarm Threshold Settings

Fixed gas detection systems provide alarm output signals to alert people and initiate corrective action. The alarm settings must be low enough to ensure the safety of people and equipment, but should not be so low as to cause false alarms, sometimes caused by background gases, sensitivity to other gases or vapors, or sensor signal drift. If false alarms are a problem, one option is to use voting: two detectors must detect hazardous gas levels before the alarm activates. In determining optimum alarm levels for fixed gas detection systems, consider the following:

- Applicable industry standards or codes
- Fire/explosion risk of the gas(es)
- Toxicity of the gas or vapor
- Typical background gas levels
- Size and magnitude of the potential leak
- Whether the area is occupied or unoccupied
- Time required to respond to the alarm
- Corrective actions required



*A pair of open-path gas detectors detect gas in the air between the two sensors*

### Selecting Gas Detectors

#### Third-party approved

Fortunately for users of fixed gas detectors, a number of independent agencies now have documented safety and performance criteria for fixed gas detectors. Manufacturers must submit their instruments to these agencies, or affiliated test labs, for testing to ensure compliance with the standards and mark their product as "certified." Independent product safety and performance certification

# Selecting Gas Detectors for Application Protection

benefits end-users by providing a level of assurance that the product being considered for purchase is actually fit for duty. Following is a summary table of agencies and criteria to which they require compliance.

## Intelligence

The latest fixed gas detection instruments and systems often offer on-board digital intelligence, meaning they deliver diagnostic capabilities, historical data logging, digital communications protocols, and provide additional microprocessor-based functionality. The most dominant digital protocols include HART and RS-485 Modbus, although proprietary digital protocols are also available.

## Mean time between failure

New gas sensing technologies are available that significantly improve the mean time between failure. Foremost of these new technologies are non-dispersive infrared (NDIR or simply IR) optical gas detection devices that sense the presence of flammable hydrocarbons based upon their tendency to absorb infrared energy in a certain wavelength. This nondestructive measurement technique results in overall excellent service life expectancies, as long as 10 years in some cases.

## Sensing technologies for combustible gases

For detection of combustible gases, the most common choices are catalytic and infrared sensors.

Catalytic sensors detect a wide range of combustible vapors, including hydrocarbon, hydrogen, and acetylene. Catalytic sensors offer good repeatability and accuracy with fast response time and low initial cost. A catalytic sensor's greatest weakness is that at high combustible gas concentrations, there might be insufficient oxygen to catalyze all of the combustible gas, resulting in a decreased signal of gas concentration less than 100% LEL. Catalytic



*Nanotechnology MOS (NTMOS) sensors significantly improve MOS performance in both arid and humid environments*

sensing requires routine calibration (typically every three months or less). Catalytic sensors are susceptible to poisoning from exposure to substances such as silicones, halogens, tetraethyl lead, acid, pvc vapors, and other corrosive materials. Sensors can fail without annunciation, hence the requirement for routine calibration or bump testing.

Infrared (IR) detectors are immune to poisoning from contaminants and require less maintenance than catalytic. They are unaffected by prolonged exposure to gas, high gas concentrations, and changes in oxygen level. Unlike catalytic sensors, some IR detectors are fail-safe, meaning that the instrument checks itself and reports any internal condition preventing detection capability. IR sensors can detect only hydrocarbon-based gases and vapors. IR sensors do not detect the presence of substances such as hydrogen ( $H_2$ ), carbon disulfide ( $CS_2$ ) or acetylene. Apply IR sensors in combustible-gas applications where hydrocarbons are present.

Performance Requirement	FM 6310/6320 (2001) ANSI/ISA-12.13.01 (2000)	CSA C22.2 #152 (1988)	EN 61779-4 (2000) IEC 61779-4 (1988)
Unpowered storage	X	X	X
Calibration and adjustment	X	X	X
Stability	X	X	X
Alarm set point(s)	X	X	X
Temperature	X	X	X
Pressure			X
Humidity	X	X	X
Air velocity	X	X	X
Orientation			X
Vibration	X	X	X
Warm-up time			X
Time of response	X	X	X
Flooding	X	X	X
Power supply variation	X	X	X
Voltage transients		X	X
Electromagnetic field	X		X

### Sensing technologies for toxic gases

Currently, two main fixed-detector families are available to detect toxic gases: electrochemical cell and Metal Oxide Semiconductor (MOS) sensors.

Generally considered the workhorses for toxic gas detection, electrochemical sensors are relatively stable, repeatable, and consistent. Used to detect a wide range of different toxic gases in a variety of different applications, electrochemical sensors are available in different sizes and packages. Electrochemical gas sensor limitations include restrictions in very hot and very cold environments. Some sensors use an electrolyte that can evaporate in hot arid conditions. They are generally not fail-safe, meaning they must be visually inspected and routinely calibrated to ensure proper operation.

MOS sensor strengths include long life, wide operating temperature range, and excellent performance in low humidity environments. Historically, MOS sensor stability was not ideal in regions prone to major changes in ambient relative humidity. However, nanotechnology MOS (NTMOS) sensors are now available that significantly improve MOS performance in both arid and humid environments. These new sensors also enhance sensor speed of response to dangerous hydrogen sulfide gas concentration levels.

### Installation and Coverage Recommendations

Although gas detection system design and performance requirements exist through some regulatory authorities, there are no documented rules concerning optimum detector placement or quantity requirements. Hazardous operation (HAZOP) analysis, along with proper planning and placement of sensors is the first step in protecting workers and assets from gas hazards within any facility. However, best practices show that identification of most-likely sequence of events leading to a gas leak, and typical environmental conditions during the leakage, are the best way to identify optimal sensor installation points.

#### Where and how many?

Consider these factors when evaluating optimal placement and quantity of gas detectors: gas or vapor source, ignition source, gas density or buoyancy, location (indoors or outdoors), ambient temperature, and personnel location.

**Gas or vapor source:** To locate potential gas or vapor sources, review Process and Instrumentation Diagrams (PIDs), facility maps, and hazardous-area classification drawings. Evaluate the characteristics of potential sources including pressure, amount of source, source temperature, and distance. Common areas for releases include pump and compressor seals, instrumentation sources, valve seals, gaskets, and sample points.

**Ignition source:** After determining the presence of combustible gas, identify sources of ignition – sparks or high-pressure gas release areas. Place the detector between the ignition source and any potential source of the gas or vapor.

**Gas density, or buoyancy:** Gas or vapor that is less dense than air (1.29 g/cc at normal conditions) will rise in still air. Gas or vapor that is denser than air will settle to lower elevations in still air. The detector typically should be placed 45.7 to 61 cm (18 to 24 inches) above level where the gas would settle. Remember that temperature affects the density of a gas. Heating decreases the density of a gas and makes it lighter. In fact, heating or cooling a gas by 30°C (54°F) changes the gas density by approximately 11%. Pre-stratification by thermal

sources can delay or prevent gas detection near heated areas or ceilings. This typically occurs where heat sources are near the ceiling or where roof decks are heated by solar radiation and no suitable mechanical ventilation is provided. If such pre-stratification potentials are present, then placement of the detector in area(s) unaffected by the stratification is recommended.

**Indoors/outdoors:** The environmental setting greatly influences vapor dispersion characteristics and gas detection ability. Typically, indoor settings mean that the overall hazardous area is well contained and that air flow can be identified and controlled. Ceilings and walls usually are the likely areas for gas accumulation and area delineation. Point(s) of human contact are usually identifiable. Outdoor settings mean the air flow is less controllable with few distinct areas of gas accumulation. These areas present a challenge that requires comprehensive application analysis and sound engineering judgment.

**Ambient temperature:** Determine the maximum ambient temperature. Include all nearby hot surfaces, such as motors, pumps, or steam lines. The maximum ambient temperature plus a safety factor of 50°C to 60°C should be less than the flash point of the monitored gas.

**Location of personnel:** Particularly in situations dealing with toxic gases, it is extremely important to consider the locations of people at the facility. To place a sensor accurately between the leak source and the people, review PIDs, facility maps, and hazardous-area classification drawings.

#### Useful accessories

The availability and routine use of gas detection system accessories often ensures proper application, operation, and maintenance of an installed gas detection system. Typical useful accessories include compressed gas calibration kits, sensor separation kits, remote gas-tubing kits, duct-mount adapters, and handheld communicators.

#### Combination of open and point

Optimal protection of a facility can be achieved through the simultaneous use of both open path and fixed gas detectors. Point detectors should be installed at or near known high-risk gas leakage points or accumulation areas to provide specific information on the level of gas present at these areas. Open-path gas detection systems should be installed at plant or process area boundaries, where they can monitor the plant perimeter, and provide an indication of overall gas cloud movement in and out of the facility. It is possible to identify and track the movement of gas clouds throughout the facility by monitoring the output signals of all the gas detectors on a common workstation graphic display screen.

#### Technology and Technique

Gas detection design relies on both technology and technique. After becoming familiar with the tools of the industry, talk with detection system providers. They will know the most effective ways to install and use the devices and system.

In general, look at process design drawings and consider where gas leaks can happen. Make sure you are using the proper technology to see the hazard. Look seriously at the safety standards you are required to meet and judge whether devices have undergone full third-party testing. And take full advantage of the experts that know the safety devices and system you decide to implement. **IFF**

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# The Scenario Choices For Very Large Pool Fires:

## Determination of Heat Flux

**By Jeanne van Buren**

Reprinted courtesy of *The Catalyst*

The radiation heat contours of computational fluid dynamics (CFD), used to model fires, are used by various stakeholders for different purposes. All the CFD's are based on the Navier-Stokes equations for fluid flow phenomena. Generally accepted models use RANS (Reynolds Averaged Navier Stokes) and LES (Large Eddy Simulation). So many combinations of variables are possible that it is impossible to put them in the software. Therefore all these models are at best a good guess of the actual situation. As long as we have no other options this is what we have to work with. But using the proper model together with the right data derived from a well thought through scenario is however conditional.

**B**efore we start putting data in these computer models we should establish what sort of pool fire we are dealing with. We should distinct between a pool fire and a spill fire. Spill fires are not banded or diked. There are three sorts of spill fires.

- An instantaneous spill fire which burns away quickly (10-15 minutes).
- A spill fire with a supply of fuel where the burn rate of the fuel is in equilibrium with the supply of the fuel. Ergo, the size of the spill will stay the same.
- A spill fire with a large fuel flow. The fire surface will increase unless the fuel can freely flow to some sort of containment.

in more soot production – depending on the product involved towards the centre of the pool as air entrainment will become more difficult. Outcomes of generally accepted fire models used to determine the radiation heat contours of these shallow banded pool fires, should be taken serious for any (pre) planning purposes including emergency response.

In general, the formation of soot in hydrocarbon pool fires, shallow or deep, is more likely if the product has a C : H ratio of > 3 : 10 and/or no oxygen molecules in the molecule.

Now let us look at deep large pool fires. When is a pool fire a large deep pool?

From the modelling point of view, a deep large

**Outcomes of generally accepted fire models used to determine the radiation heat contours of these shallow banded pool fires, should be taken serious for any (pre) planning purposes including emergency response.**

With spill fires it has to be considered that they eventually will burn back to the source of the spill, which may pose additional problems.

Now back to the pool fires. The depth of this banded or diked fire is the first issue we have to consider. There is a distinct difference between shallow and deep pool fires. Shallow pool fires are quite fierce and behave like banded spill fires. The flame will move along the surface. A lot of heat from the fire will go into heating the liquid, supporting a fast burn rate. Larger surfaces can result

pool fire consists when the diameter of the fire is > 3 meter. Also the pool layer must be deep enough for the fire to burn over 1 hour. Above a diameter of 3 meter the deep pool fire can have different characteristics than smaller fires, depending on the product involved.

Emergency responders however use the term large pool fire when the net surface of the fire is well over 1000m<sup>2</sup> and will last longer than 1 hour. This is to do with the equipment, foam and staff needed to tackle this fire and the total amount of

*The Buncefield disaster attracted attention from around the world.  
Picture courtesy of Duncan White*



An advertisement for Simulation Ltd. The top half features a large image of a fire at an industrial facility. Overlaid on this are several circular icons representing different sectors: INDUSTRIAL (flame), CIVIL AIRPORTS (airplane), MARITIME (ship), MILITARY (jet plane), OFF SHORE (oil rig), ANTI-TERRORIST (bomb), TRAINING (person in a hard hat), and LOCAL AUTHORITY (house). Below this, the text "THE NEW FLAME IN SIMULATION" is written in large, bold, white letters. At the bottom, the company logo consists of a stylized flame icon above the word "Simulation". Below the logo, the company address is listed: REPTON HOUSE, BRETBY BUSINESS PARK, ASHBY ROAD, BRETBY, STAFFORDSHIRE DE15 0YZ. UNITED KINGDOM. Further down, contact information is provided: FOR FURTHER INFORMATION CONTACT US ON: tel: +44 (0) 1283 213395 fax: +44 (0) 1283 213396 mail: info@simulation.uk.com web: www.simulation.uk.com

water required to fight the fire and cool structures affected by the radiant heat.

Before we start modelling we like to know if direct ignition is anticipated or we are dealing with an instantaneous (static) pool with fuel vapour built-up, before ignition. If the fuel is volatile, an unconfined vapour cloud is likely to form, which, after (explosive) ignition moves back

**Only the low atmospheric winter inversion layer contributed to the extent and severity of the effects at Buncefield.**

towards the spilt fuel, resulting in a pool fire. Not only are the effects of both scenarios different, the number and sort of lines of defence violated are different too. The latter has many similarities with the Buncefield scenario. Only the low atmospheric winter inversion layer contributed to the extent and severity of the effects at Buncefield. Winter inversion layers are normally not considered when modelling such incidents or any other incident.

So make sure everyone not only gets the outcome of the modelling exercise, but also the scenario and the assumptions on which the scenario was based.

When dealing with very large pool fires, the shape, the height and even the material of



Picture courtesy of  
Duncan White

the bund may have an effect. If the edge of the bund is higher than fluid level it may locally intensify the burning, but if the bund material is able to transport the heat, it may slow down the burn rate. Crosswind together with the shape of the bund wall may also influence the heat radiation. Modelling software does not take this into account.

If the fluid is a mixture like crude, the composition of the fuel will change when the fire endures. This too is not taken into account when modelling the fire.

At some moment in time a very large pool fire – if not extinguished by that time will – become fully developed. Soot built-up will decrease the radiant heat emission, unless we are dealing with a fairly clean burning fuel like alcohol. For heat flux

## If the fluid is a mixture like crude, the composition of the fuel will change when the fire endures.

modelling purposes the fire should now be split up in two layers. One layer represents the fire, while the second layer represents the layer with soot above the fire. There are not many models that use this two layer approach for fully developed very large pool fires.

All the characteristics of any large pool fire will change in time due to the effect the soot formation has, the heating up of the liquid in the pool

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due to the convective heat of the fire, the weathering of the product on fire, etc. As an emergency responder you not only have to be prepared for these changes, you also must anticipate working with the benefits of these changes.

As mentioned earlier, the outcome of a pool fire modelling exercise, usually present the worst case effects of an incident scenario, which should be used for (pre)planning purposes.

But we should also be willing to look further and show sympathy for the incident commander. Besides the preplanning and training he likes tangible data from the actual incident he is confronted with. In the Netherlands each structure exposed to a heat flux of  $\geq 10 \text{ kW/m}^2$ , must be cooled with water. In practice organising the amount of water required to do this during a very large pool fire may pose a challenge. And what about all the run off (polluted) water and the damage it may cause either on land or to the aquatic life.

It would be very helpful if the commander and his team could actually measure the real heat flux at intervals during the fire – for safety of his personnel and to support of efficient use of his resources.

The Stefan-Boltzmann law, may be able to help us out here, it states that that the total energy radiated per unit surface area of a black body in unit time (known variously as the black-body irradiance, energy flux density, radiant flux, or the emissive power),  $j^*$ , is directly proportional to the fourth power of the black body's thermodynamic temperature  $T$  (also called absolute temperature).

Does this mean that if the emergency responders are able to read the temperature of an object affected by the radiation of a fire, with for instance a portable heat reading camera, they can use this information to determine if a construction has to be cooled. Perhaps we have to be innovative and paint small ( $10 \times 10 \text{ cm}$ ) black surfaces (based on the incident scenario) on the constructions to enable this measurement. Maybe all storage tanks will in future have horizontal black lines ( $10 \text{ cm}$  width) half way up the cylinder wall. Surely this is something to explore. Or should we all stick together and start funding the development of non-contact portable heat flux sensor. It would prevent the fires spread so much easier.

By the way, the widely used ear thermometers, is based on the same principal. It measures your temperature by detecting the amount of radiant heat (infrared energy) emitted by your eardrum.

I would like to invite readers, especially companies, who are willing to invest in the development of reliable methods and (non contact) equipment for establishing the heat flux (up to  $35 \text{ kW/m}^2$ ) to a structure during a fire. **IFF**

**Jeanne van Buren** is a Safety specialist working with the Rotterdam-Rijnmond regional emergency response organisation in The Netherlands. She has a BA in Process Engineering, Chemical Engineering, Applied Chemistry and Environmental Engineering and an MSc in Environmental Quality Management as well as Risk Crisis and Disaster Management. She is currently carrying out a PhD research into integrated fire safety during the life cycle at SEVESO sites.



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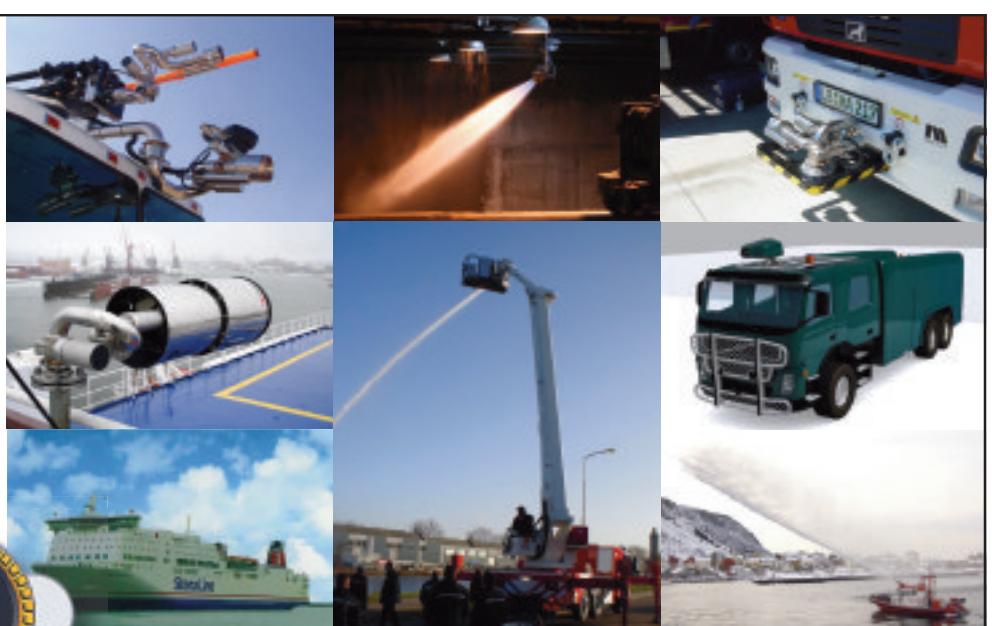
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# Taking Off With R Firefighter Traini



Aircraft fires represent a special challenge in firefighting – not least because of the extreme nature of the potential hazard and the immediate impact on both the passengers and air crew.

**By Paul Harvey**

Draeger Limited

**F**ire can develop in many places on an aircraft; in an engine, on the landing gear, in the cargo hold, in the passenger compartment, in overhead luggage lockers, in the cabin seating areas or in the galley. An external fuel leakage can also result in a fire under the aircraft itself. Each fire requires an individual approach through realistic training with a variety of internal and external fire scenarios.

Past events, however, have shown that around 80% of all aircraft accidents happen during the take-off and landing phase and, for this reason, emergency personnel must also receive regular response training to ensure that they are ready for every eventuality. As with all training it must be realistic, safe and repeatable, whilst limiting its impact on the environment.

Airports are categorised on a scale of 1-10, based on the largest size of aircraft that regularly use the airport. Specific standards are laid out for the emergency services for each category, including the number of fire appliances, the minimum performance levels for appliances, crewing numbers, training for firefighters, the amount of water, foam and other extinguishing agents, the type of rescue equipment to be carried, emergency access

routes, and additional water supplies. In addition to direct passenger and aircraft considerations, emergency preparedness and training must also be catered for.

The use of aircraft firefighting simulators, such as those designed and built by Draeger, bring a real-time, realistic approach to this dangerous task. From complete, full size and to scale aircraft, through to custom designed aircraft combinations these training aids not only enable airport firefighters to meet International Civil Aviation Organisation (ICAO) requirements but they enable them to remain safe whilst tackling the fire quickly and effectively.

The search for injured people and the evacuation of passengers via an emergency slide, for example, requires a well trained and competent team. A plane filled with smoke or engulfed by flame can be difficult to tackle at the best of times and prior knowledge of a plane's layout will greatly enable firefighters to find their way through the cabin.

Upon entering a simulator, however, firefighters will obtain far more than just an idea of a particular aircraft's layout. Wearing full BA and carrying search and rescue equipment, they will realise the

# realistic Aviation ng



limited space in which they have to work and be able to experience, first hand, the fierce heat and immense flames that can be involved with a fire on board. Visibility is likely to be zero and the rescue team will be under high physical and psychological stress. Team spirit and communications skills will be called for and a calm, organised approach will be essential.

By conveying the atmosphere, the environment and the emotion that a real emergency involves, state-of-the-art simulators are going a long way towards preparing firefighters for the worst possible encounters.

The Draeger Passive Aircraft Trainer (PAT), for instance, is a wide bodied, multi-level aircraft trainer in the form of a full size replica of the Boeing 747. It can be used to perform various incident scenarios and practice evacuation procedures. Constructed using over 250 tonnes of corrosion resistant steel, it contains many realistic features and can be filled with cosmetic smoke for increased realism during search and rescue simulations.

Featuring compartment settings and door openings, it also incorporates accurately scaled engine nacelles and an evacuation slide from the gull wing door on the upper deck. Fully equipped with respiratory equipment and thermal imaging cameras, the PAT allows rescue personnel to practice combing the internal areas in the search for passengers, crew members and the cause of the incident. For added realism, numerous 75kg mannequins can also be strategically placed

throughout the aircraft.

This type of system is already in use at Bangkok's Suvarnabhumi Airport which handles around 45 million passengers a year. Five of its gates are already equipped to handle the new Airbus A380 and the three stations of the Aircraft Rescue and FireFighting (ARFF) Department are manned 24 hours a day for firefighting, rescue missions and fire prevention purposes.

Whilst Bangkok's ARFF may be required to respond to fire alarms that actuate in the terminal buildings or other incidents that occur on the airport grounds, their primary task is the protection of aircraft and their occupants. For this reason, they use a number of turnkey aviation training systems from Draeger which combine a Training Facility complete with the PAT and a Fuel Spill Trainer. They also utilise a self contained breathing apparatus (SCBA) Training Gallery and a complete Control and Operating System.

Located directly next to the new terminal, the 2.6 hectare Training Facility is home to three separate trainers, each of which is controlled via the central computer terminal housed within the control building.

Leaking aviation fuel that ignites is possibly one of the most dangerous situations in aircraft firefighting. The right tactics, proper teamwork and the correct use of extinguishing media will bring a successful end to a life threatening scenario.

Bangkok uses a state-of-the-art Fuel Spill Trainer (FST), complete with a Boeing 737 replica at its centre, to simulate a fuel spill fire. Mindful of the



cost and environmental impact of kerosene, Draeger uses liquid propane gas (LPG) to generate flames. Designed to maximise safety and improve the carbon footprint, the system incorporates a wide range of safety systems and proven control techniques.

With a total surface area of over 750 sq m, it is

obviously important that a realistic and versatile training environment is maintained. As a result, the FST incorporates a total of 66 individually controlled sections which can be set, by the operator, to run at different flame heights and at different times.

Benefiting from Draeger's unique Media Detection system, it also features more than 130 sensors that automatically detect the use of extinguishing media and cause the fire(s) to react accordingly. In addition, the computerised system is able to control the spread of fire to accurately represent a real situation. For maximum flexibility, as well as other training foams, the two most commonly used foam types, i.e. Film-Forming Fluoroprotein (FFFP) and Aqueous Film Forming Fluorochemical (AFFF) are fully compatible with the trainer and can be mixed with water to produce finished foam.

Repeated live fire training could obviously take its toll on the longevity of the system. To provide ongoing protection, the simulator incorporates a water drenching system along the length and breadth of the B737 replica. This ejects a protective layer of water over the fuselage at a rate of 10.2 litres/min/sq m in line with NFPA 15 Regulations.

Training on the correct use and maintenance of SCBA is also vital to the success of any search and rescue operation and aviation firefighting is no different. For this reason, SCBA sets are provided to all operational aviation fire service personnel to ensure protection from smoke, toxic fumes and other substances. Training with this life-preserving apparatus is given in a specially designed training gallery.

Located next to the two aircraft trainers, the





Bangkok SCBA facility provides heat, humidity, cosmetic smoke and confined space training and allows firefighters to practice any number of search and rescue scenarios. Providing both new recruit training as well as skills maintenance, it ensures that all personnel are able to complete live training prior to deployment. Different procedures such as evacuation, for instance, can be rehearsed safely by sending firefighters into a smoke logged Boeing 747, whilst the integral safety procedures allow constant communication to be maintained.

Operational control is essential at all times to ensure both safety and effective training. A central computer operates the entire facility from a control room which overlooks the training ground. This proven hardware configuration and Windows-based operating system provides real-time information to the controller in English, German or the local Thai language. Easy and simple to use, this innovative operating system can perform self-diagnostic checks to ensure full and correct system status prior to training, and can also capture a wide range of data for use by the training and maintenance teams during post-training analysis.

Other configurations can be found throughout the world in Gran Canaria, Kuala Lumpur and Europe. One of the most recent European installations includes the combination of both single and twin-aisle aircraft at Cardiff International Airport. Custom built by Draeger, this unique steel aircraft mock-up comprises two sections replicating Boeing 767 and Dash 8 aircraft. Thirty metres in length, it offers 17 different computer-simulated firefighting scenarios from cockpit fires to fires starting in the galley, toilet, landing gear, seats, fuselage and engines. As well as a ceiling flash fire, it also incorporates an external fuel spill fire area.

Built with safety in mind and incorporating an automatic monitoring system, the Cardiff rig also features Draeger gas detection sensors, temperature sensors and a remote support service via data interface. As well as automatic shutdown in the

event of a gas leak or excessive heat generation, the system includes several emergency stop buttons which, once activated, will automatically shut down the simulation and start ventilation to remove smoke, and cool the simulator.

With water conservation in mind, any water generated during the training exercises can be recycled and used again for certain applications, such as when cooling the mock-up's steel structure.

Preparing for the disaster that, hopefully, will never happen, also involves major incident training, command and control training and training in counter terrorist applications. As an added benefit, these aircraft simulators and control systems can all double as bases from which these additional needs can be met.

**Occupational health and safety,  
together with industry  
regulation and guidelines,  
continue to steer this  
ever-evolving market.**

Without doubt, the modern training arena remains a dynamic and exciting environment which requires continual re-assessment in the search for improved efficiencies and compliance maintenance. Occupational health and safety, together with industry regulation and guidelines, continue to steer this ever-evolving market.

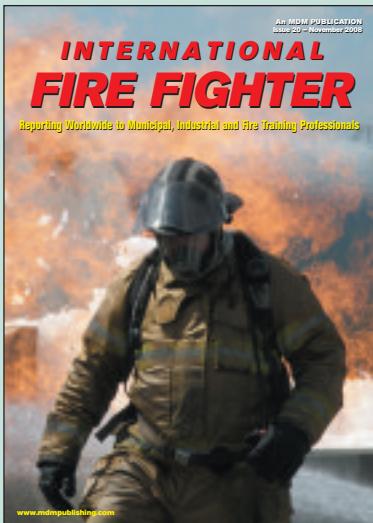
By working closely with its customers, Draeger is able to lift the burden of training by developing aviation firefighting systems that ensure that personnel, equipment and systems are equal to the demands placed upon them. The goal, at the end of the day, is not just to help emergency personnel to maintain the required state of preparedness in line with international regulatory requirements, it must be to ensure that they also remain safe. **IFF**

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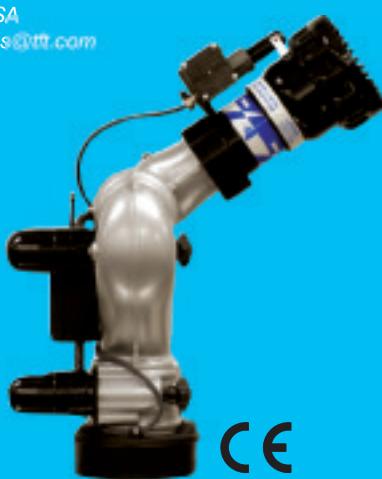


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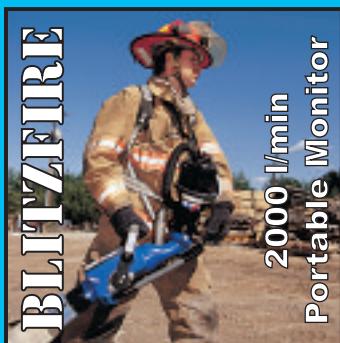
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